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Granite in the Workshop.

As we have been exercised a good deal upon granite and its architectural treatment lately, a few words as to the method of working it may be of interest, and may furnish hints to those who have not as yet had much to do with the material as a medium for architectural design.

A granite quarry is, as may be supposed, much the same as any other quarry; and considering the extensive use of the material and the great name it has in engineering operations, one is surprised to find that Rubislaw Quarry, from which comes the Aberdeen grey granite which has, perhaps, been more largely used than any other variety, is of such comparatively limited extent as it is. A great deal of stuff, however, has been sent from this hole in the ground to all parts of the world, and arrangements were being made, at the time of our visit, for a deep cut below the present general level, to get at some more of the best material. The sections of rock exposed show considerable variation in tint and surface, representing corresponding variations in quality and value; the different qualities do not, however, occur in a stratified form, but in irregular patches. The first breaking up of the material is made by blasting with dynamite, which is inserted in the form of cartridges 2 in. or 3 in. long, by about ½ in. or ¾ in. thick; innocent-looking little paper packages containing a flakey yellowish powder, into which is inserted the end of the "match" with a metal cap over it, which explodes when the match is fired; as dynamite, despite its tremendous qualities, requires something in the nature of a percussion in firing it to arouse its own energies effectively. A small hut in a corner of the quarry contains dynamite enough, we should imagine, to blow up Aberdeen, if all the wonderful stories are true about the enormous power of this explosive. The small cartridges must do immense execution on the rock; for granite, the hardest of building stones, is also one of the most brittle, and is easily split. The method employed in splitting a large block in two pieces is to drill a few holes, about 2 in. deep, along the intended line of cleavage, and then insert iron wedges and drive them with a hammer, an operation which separates a block of considerable size very easily. This is almost the only operation at the quarry which seems at all special to the material, and that is only so in the make and shape of the wedges employed, which are circular, as it is much easier to drill a hole in granite than to cut one square. The smaller pieces which are the result of the blasting and subsequent operations are used a good deal as backing for ashlar walls; attempts have been made to use them as the material for a rubble architecture in granite, but from what we saw of the peculiarly sharp-pointed wedge-like forms which the stones that split off seem to assume, we should hardly suppose that the material as got from the quarry could lend itself very well to anything that could be called architectural work in this form. Rubble building in granite has been more generally done, when done at all, not with quarry stuff but with the loose stone which is found on the surface in many granite districts, in forms more or less rounded by attrition under the action of water and ice countless ages ago. Some of our readers may not be aware that the Eddystone lighthouse, which is soon to be displaced, was in great measure built in this way, of "moor-stone," as it was called, from being found lying about on the moors of the district, in rounded boulders, which were used unworked in combination with mortar. No stone could probably be so hard and practically indestructible as this pebble granite, with its surface rendered additionally impervious by the weathering of centuries.

But we will step from the quarry to the workshop, which in this case shall be that known as the "Aberdeen Granite Works," to the proprietors of which our thanks are due for their courtesy in enabling us to see as much of the *modus operandi* as could well be seen in an afternoon's visit of necessarily limited duration. Over a considerable portion of the area occupied by the works, we find the raw material piled in large roughly-shaped cubes of granite placed in horizontal layers one over another, and capable of being readily lifted about, when required, by a travelling crane. These blocks are first very roughly shaped at the quarry into a sufficiently regular form to be convenient for stacking; after that, everything is done at the works; and in the sheds around we find the material under different stages of treatment. The stone is got into approximate shapes by the blows of short heavy-headed axes, which might be better described as hammers with the striking portion worked into a sharp edge instead of a superficies, the instrument having to be weighted with much heavier metal than is the case with the style of weapon usually called an axe, in order to give the weight and momentum requisite to make any impression on the material. After this operation, it is "axed granite," and is in the state in which it is used for rusticated work in architectural design; and, indeed, occasionally for the entire facing of buildings. There is a terrace of houses on the way out to Rubislaw quarries, treated in this way, and which looks very well. The next stage in the mason's part of the work is the further shaping and finishing of the surface with the cold chisel and mallet; the chisel being again a thicker and heavier implement, and rather more blunt in shape, than that used for ordinary masons' work. Mere sharpness of metal will hardly touch granite; it requires weight and force in the blow to break up the particles at all. And in looking at this part of the work we realise, better than when it is under machinery, the extreme hardness of the material. There is something in the sound of the blows upon the stone which is most peculiar, and conveys to the ear the notion that the task of shaping a material which gives such a dull iron sound as that when struck must be one requiring an unlimited stock of patience, and a very strong frame to stand the perpetual jar of the blows on the apparently unyielding surface. It will give some idea of the tough character of the work if we mention, what we were assured was the fact, that the same chisel cannot be used on the granite for more than two or three minutes' work with any effect; after that it becomes too dulled to touch the surface, and has to be re-ground. In consequence, the business of taking the chisels in bundles to the grindstone, and bringing them back to the workshop, is an occupation employing a small staff of labourers, who are told off for this duty only. The tools are touched up on the grindstone sufficiently for another bout; and when by a series of grindings the chisel begins to get too thick at the end, it then goes to the smith's to be regularly re-set. After the chisel comes the "fine-axe," which is another implement of hammer-headed appearance and shape, but in which the head carries half a dozen or so of parallel steel blades with a little space between them; and with this implement the surface is dressed to the finest finish it is capable of, short of polishing.

In dealing with circular columns, for which granite is so much (perhaps too much) used, the turning-lathe, in a modified and purely mechanical form, is used. The block which is to be made into a shaft is got into as near a true circular form by hand as can be, and is then fixed in a lathe, and operated upon by a kind of plate-shaped circular blade on either side, placed in a vice so as to present its cutting edge at about an angle of 45° with the shaft; water is kept dripping on the granite at the point where the cutters work, and the frames or vices in which they are fixed move automatically along the length of the shaft at a very slow rate, and after reaching the end are set fresh for another journey along the shaft, till it is brought to the dimensions and the surface to be ready for the polisher. With this exception, the working of the granite up to the polishing point is almost entirely by hand; there is little or nothing of cutting and planing surfaces by machinery, for the material is too stubborn for these rapid methods of working, and only yields to time and patient labour. As an instance of its stubbornness under the action of machinery, we may mention an operation in which machinery is necessarily employed,—that, namely, of sawing a block into thin slabs to be subsequently

polished for use in a decorative manner. This is done by a frame full of parallel bands of iron working backwards and forwards on the edge of the block to be sawn up, and we were shown a slab, some 4 ft. or 5 ft. in width, the sawing through of which had occupied twelve months, though a piece of Sicilian marble of the same size would be got through in less than that number of days. In reference to this we notice again a fact illustrating the incapability of iron or steel by mere sharpness or hardness to make itself felt against granite. Contrary to what most persons would expect, the iron bands used for this sawing process are not of the hardest iron or steel; the special object is to have them as soft as possible, and the iron is even softened by a special process; the result of which is that the blade takes up the particles of quartz which are disintegrated by its first attack, which form the hardest ingredient of the granite, and which become imbedded in the blade and in reality do most of the cutting. The granite, which would be impervious to mere iron or steel, however hard and sharp, is thus made literally to cut itself, and the iron blade becomes merely the medium for carrying the friction of the quartz particles backwards and forwards. There is one other form of cutting by machinery which is done on much the same principle, the cutting out of circular holes in crosses and monument stones for example, as a portion of their ornamental design: this is done by a revolving iron pipe working vertically against the surface of the granite, weighted above, and gradually cutting into the slab till it gets through, when the central portion of the stone can of course be taken out and may become a section of a circular shaft, while its place remains as a circular hole, forming perhaps the separation to between the arms of a cross or other such design. This, we confess, is a method of designing in granite which had better be more sparingly used than it is: it is an exceedingly mechanical way of producing ornamental work, and if carried far, must necessarily lead to a sort of "shop" appearance in the designs thus produced, quite in opposition to really artistic treatment or feeling.

So far we have considered granite working apart from the polishing. When we come to this portion of the work, we pass almost entirely from manual labour to machinery. The polishing of granite differs in no way in principle from the polishing of marble or other material of that description; it is a progressive use of more and more delicate materials on the surface, so as to bring it up by degrees to a glass-like finish. We have already hinted our opinion that the advantage of polished granite in external architecture has been greatly overrated, in the south especially (in Aberdeen itself external polish is really little used). It belongs to the purely mechanical sources of effect, and tends to give a showy and splashy appearance to external architecture by no means agreeable, unless it is used with great moderation and judgment. Still there is no doubt that the decorative effect of the material, especially in its chromatic aspect, is only half brought out until it has received at least a certain amount of polish. The blocks piled in the yards of the works, just as they come from the quarry, have none of that sharply distinctive colour and character, by which, when polished, every one can at once see the distinction between Rubislaw and Peterhead, Cairngall and Kemnay; and so different, indeed, is the tone assumed by the material under different treatment, that you may see an apparently polychromatic effect in three tints, all produced from the same granite, in its several stages of axed, fine-axed, and polished; and it would be possible to introduce a fourth tone from the material in an intermediate state of polish, and before the final gloss is on. The principal medium in polishing is emery powder, and the final finish in delicate work is given by oxide of tin. The machines for applying the polish to different sorts of surfaces are various in their construction and operation, and one or two of them somewhat singular in their appearance and the method of applying the power. The polishing of large flat slabs is carried on by a series of concentric iron rings turned round horizontally upon the surface of the granite, the turning power being applied to a vertical axle rising from them. As the rings turn rapidly, the slab at the same time is moved slowly backwards and forwards to the extent of 2 ft. or 3 ft. each way, on a timber framework, the whole reminding one of an old-fashioned mangle at work. As in the case of the cutting-bands for sawing, the rings which do the work are made of soft iron, and emery powder in water is liberally served on to the surface of the stone. This mixture runs off by degrees into a trough at the side of the stone, and is then carefully collected and served on to the stone again; the economising of the emery being a point of some importance in the conduct of the operation, and affecting the gains of the workman more or less, who is paid by piece-work. The emery in the process gets gradually ground smaller and finer, so that the material makes its own adjustment to the object in view, the getting a gradually higher and finer polish. The polishing of mouldings is carried on in another house, by means of a series of planes cut to the section of the mouldings, and working on them with emery: the stone, supposing it to be a piece of a cornice, is placed on the floor of the shed in such a position that the moulded portion which is to be polished is brought between the slides on which the plane works, and the plane is pushed backwards and forwards over it, the motion being communicated to the plane by a rod connecting it horizontally with a large heavy piece of triangular timber framing standing upright and working backwards and forwards on a centre as far beneath the floor as can be got, so as to make the action on the rod as nearly horizontal as possible: the movement further adjusting itself by a joint in the rod which gives it a play something like the piston and connecting-rod of an engine. The appearance of these large tall frames jerking backwards and forwards all along one side of the room is odd enough. They were formerly hung downwards from the ceiling, but the alteration was made of placing them in the floor in order to get a travelling crane and tackle to work along the ceiling for shifting the blocks of granite under operation; a matter of consequence, as in the case, for instance, of a square pier-capping moulded on every side, the block will have to be shifted four times in the course of polishing, to bring each side under the plane. The cylindrical shafts are polished by turning, as in a lathe, and passing under iron weights placed upon them, mostly cut approximately to fit the curve of the cylinder, though this is not a necessity of the operation; the revolving cylinders are kept served with emery, and the finishing is given frequently with sacking or fibrous cloth interposed between the granite surface and the polishers. It may be observed that thin columns will not bear polishing in very long lengths, they would break under it; so that if architects design very thin and delicate shafts of polished granite, they must not expect to get them in one length. It may be here noted also that polishing reduces the surface by about one-tenth of an inch, which is accordingly allowed for in preparing sizes for polished work. It is also to be remembered that the polishing-machines will not work into angles or undercuttings, so that all such portions, such as mitres of mouldings in re-entering angles, &c., have to be polished up afterwards by hand; but this is so thoroughly done that it is impossible, as far as we observed, for the minutest inspection to tell where the machine-polish ends, and the hand-polish begins.

A separate branch of ornamentation recently practised, and made almost a speciality by some firms, is the production of a flat ornament formed by cutting into the surface of a polished slab just deep enough to break away the polish, the contrasted surfaces forming the design. We saw some very pleasing tombstones ornamented with an interlaced design of Celtic type, which had an admirable effect for this class of object, and on a small scale. We must say, however, that when this kind of ornament is applied to form salient portions of the decoration of a building, as we have sometimes seen it, it has a very tea-caddy effect, quite at variance with the genius of granite; but we should suggest that it might be used with good effect in external architecture as a surface diaper on the retiring faces and not on the emphatic lines of a building. The lettering of tombstones is another of the more delicate pieces of work in a granite workshop: the slab to be lettered is first painted white where the lettering is to come, and the lettering drawn on the white pigment and then chiselled into the granite; in the case, that is to say, of a polished slab, as it would be impossible to draw the letters legibly on the polished surface. In regard to the sandblast, about which a good deal has been said as a great shortener of this kind of labour on granite, we found that in the Aberdeen Granite Works it was not in favour at all, for the reason that it would not work evenly, and that, according to our informant, almost as much trouble was expended in dressing up the work and levelling the cuttings afterwards as would have sufficed to cut the work by hand from the beginning.

In referring to the subject of polish, we should have drawn more attention to the fact that a very fine surface and a good effect of colour and marking can be elicited from the granite when it has reached its intermediate stage of polish, when the surface is smooth, and the markings clearly brought out, but before the glassy lustre is put on it. Having regard to the showy and over-glittering effect of fully-polished granite in external architecture, before noted, we recommend those who employ granite ornamentally in this way to turn their attention more to the half-polished stage, when almost all the fine effects of polish, architecturally speaking, are realised without the glitter which detracts so much from the repose of a design. Another point which the survey of the Aberdeen granite works forces on our notice is the importance of designing mouldings and other architectural ornaments in a broad and simple style, without too many curves, and without undercuttings, which the material does not require in order to produce effect, since its durability and brightness of surface enable the designer to produce both a good and a permanent effect without deep cutting. There are one or two houses in Union-street, by the Aberdeen architect of the last generation, Simpson, who has left so much of the impress of his taste upon the architecture of the town, in which an application of that severe classic treatment called in our old text-books "the Tuscan order" has been made with very good effect, and seems entirely in harmony with the material. Referring to what we said as to the system of cutting circular holes as a source of decorative effect, we should be inclined to reprobate also the practice, which seems to be coming in, of letting in polished knobs projecting from the face of the work; we have seen designs for tombstones and other objects ornamented in this way, and cannot but think it is a degradation of a splendid material to piece it in this way to produce a supposed ornamental effect. There is in the Museum of Practical Geology in Jermyn-street, for example, a splendid colossal tazza turned in polished Peterhead granite, which is entirely spoiled by the handles, which are obviously and necessarily let in, and destroy at once our sense of the durability and homogeneous character of the whole. It is worth while to draw attention to these points, because there is a move at present for doing more in the way of decorative treatment with granite than has been done before, and it is very desirable that such an attempt should be made with the greatest caution and judgment, lest we have a grand material more or less vulgarised in the attempt to do pretty things with it. We must humbly confess that what we saw of æsthetics at the Aberdeen granite works, as exhibited in various executed designs, did not impress us with the same sense of satisfaction as did the workmanship expended on the material. It is more than probable that much of this represents concessions to public taste, or want of taste; but surely the accomplished gentlemen who preside over this large granite workshop might do something to guide public taste a little, rather than succumb to it.

LABOUR AND WEALTH.

The question of the relation of labour to wealth has forced itself upon the attention of the public, during the present Parliamentary recess, notwithstanding the absorbing interest of the sanguinary struggle in the East. Congresses and public meetings, at home and abroad, have discussed various branches of the subject. But the most noticeable effort to bring the matter within the limits of certitude is, perhaps, that which has been made by Sir Edmund Beckett, whose letter in the *Times* of the 13th September has led to further correspondence. The proceedings of the Socialist Congress at Ghent, about the same time, tend to throw some light on the same subject.

Sir Edmund Beckett postulates the fact of the decline of trade in the United Kingdom, and attributes this to the diminished production on the part of the working men, which he holds to be encouraged by the trade unions. Mr. Potter, four days later, comments unfavourably on Sir Edmund's letter, without, however, making any such definite statement as it is possible to grasp with precision. Mr. Lloyd Jones, in the *Times* of the 21st September, denies Sir Edmund Beckett's postulate. He states that the working

men will deny that nearly every trade is in a long-continued and still increasing state of depression. The building trade, Mr. Jones says, has been better than at any previous period. The cotton exports for 1876 were the largest known up to that time. The raw cotton held in hand for home consumption in that year was more than in the singularly prosperous year 1872. The woollen trade has increased. The working men do not ask to do half work; nor has any one proved that production has fallen off to the extent of a penny. (This deficiency we will presently supply.) Finally, Mr. Jones gives a comparison between the exports and assessments of 1846 and of 1876,—periods divided by thirty years of the activity called into play by the railway system, which may be summarised as follows:—

	1846. Millions Ster.	1876. Mills. Ster.
Cotton manufactures: Exports	25	65
Wool "	7	18½
Engines and machinery "	1	7
Metals "	4	21
Linen "	3½	7
Assessed property	335½	571

There can be no doubt that a marked and magnificent development in the productive power of the United Kingdom within thirty years, is shown by these figures. It does not, however, follow that Mr. Jones benefits his own case by bringing them under discussion. It is admitted on all hands that it is to the adoption of the principles of free trade, coincident with the practical freedom given to trade by steam transport by land and by sea, and by the immediate transmission of intelligence by telegraphy, that this great bound in our productive power is due. It is true that this advance has co-existed with trade-unions. But it does not follow that it has been due to them; that it has been aided by them; or that it has not been impeded by them. It is *post hoc*,—it does not follow that it is *propter hoc*. On the contrary, the contention of the opponents of trade-unions is, that they interfere with free trade in labour. Unless this position be disproved, the figures cited by Mr. Lloyd Jones tell heavily against the cause he advocates.

It is well, however, to go to the marrow of the matter. Sir Edmund Beckett assumes that the influence of the trade-unions is in the direction of inducing each workman to do as little work as possible, and to obtain as much money as possible for that work. He also adds,—to consume as much as possible. This item may be laid aside for the present, with the observation that the more he consumes, the better supporter he is of trade and production in general, provided (which is not questioned) he pays for what he consumes. This opinion of Sir Edmund Beckett is shared by a very considerable number of those who have devoted study and thought to the subject. It is not, however, supported by any citation of facts. And to this opinion applies the contradiction (equally unsupported) of Mr. Jones, that it has not been proved that production has fallen off "by one penny."

As to this it must be remarked, that it is merely puerile to assert that the productive power of each unit of the working classes has not been diminished by the reduction of the hours of labour. That there may be a maximum number of hours in the day during which a man can work with the most effect per hour may be admitted. But no one familiar with the employment of labour will hold that we are at present anywhere near that limit. From forty-two to forty-eight hours per week may be taken as the time now worked on an average,—or rather as the maximum. We can all remember when sixty hours was the rule. It may be that a man can, with equal regard to his own health and strength, work as sturdily and as well for the longer number of hours as for the shorter. It may be, on the contrary, that he can work with somewhat more vigour for eight than for ten hours per day. But that he can do a fifth more work per hour in the shorter than in the longer time we suppose there is no one who will assert. While, then, it is possible, but not proved, that productive power has not fallen off by the entire proportion of the shortening of the hours of labour, it is certain that the diminution cannot be very much less than the deficit thus measured.

But we can take a step further. We can supply Sir Edmund Beckett with a definite piece of evidence. We can fill up the hiatus pointed out by Mr. Lloyd Jones; not only by circumstantial, but by direct, testimony. The number of men employed in the coal mines of this country (we learn from the *Pall Mall Gazette* of the 18th of March last), in 1875, was 525,843*l.*; being 80 per cent. more than the number employed in 1861. But while the number of hands thus employed was increased at the rate of 80 per cent., the output only increased at the rate of 54 per cent. In 1861, 305 tons of coal were raised, on the average, by every man employed. In 1874 this rate of production had sunk to 249 tons of coal per man. Thus comparing the first year for which we have definite returns as to the statistics of the coal industry, with that which immediately followed the highest inflation of prices, there has been a reduction of more than one-sixth in the mechanical value of the work of every man employed in winning coal. This is an exceptionally accurate test. It is one not complicated by any question of price. In other industries we may ascertain how much has been earned,—but the differences of price, from time to time, render it very difficult to say how much more or less work has been done to secure that earning. Here, on the contrary, we have a definite measure, in the simplest and least disputable form. Supposing a man to work for 260 days in the year, which we take to be quite as much as can be assumed to be the case with the majority of colliers, in 1861 each of such 260 days' work won a ton and a third of coal. In 1874 each of such 260 days' work won less than a ton of coal. There is no escaping from the conviction that the productive power of the colliery industry has fallen off by something like one-sixth between the two specified dates.

Thus, unquestionably, the country is so much the poorer. In 1874 there were 13 per cent., or thereabout, more mouths to be fed in the United Kingdom than was the case in 1861. The persons employed in industry and agriculture, in England and Wales, were taken in the census of 1871 at 6,800,000. A thirteenth part, therefore, of the industry of England depends on coal, or, rather, depends on the winning of coal. Of that thirteenth part, more than a sixth of the productive power has been wasted. Is it likely that this loss is confined to this special industry? Is it not most significant that, in the one instance in which it is possible to put the finger on the amount of work actually done, it so nearly coincides with the proportion of time abstracted from labour? Is there not good reason to conclude that the statement that the productive power of the country has been diminished 10 per cent. by the short-time movement is considerably under the mark? And is this anything less serious than a 10 per cent. income-tax, imposed by the working classes themselves on their income in the very source, for the benefit of no human being whatever, unless it be the brewer and the collectors of the revenue from the consumption of beer and spirits?

If we could point to a steady advance of civilisation, comfort, and prospects, all round, the case might be different. If England were the only workshop to supply the world with metal manufactures, with textile manufactures, with coal,—with every or with any industrial product, she might say,—"I can afford an extra day in the week's play-time"; for that is what the change pretty nearly amounts to. But such is far from being the fact. In no branch of industry are we now so supreme as to fear no rivals. What do we find stated in the *Times* of the 28th of September? "The Dudley Cut Nail Company has, it would appear, been driven out of the field by its competitors. The business of which Wolverhampton is thus deprived falls in part to Leeds, but in part, too, to Belgium." This is a most significant statement. If there was anything as to which Wolverhampton and its neighbourhood might be supposed likely to maintain the command it would have been the nail trade. Iron is handy. Coal is handy. The labour is so simple that it used to be carried on, at Redditch and elsewhere in the country, chiefly by women and children. The machinery that has superseded this low-priced labour must, of course, be more advantageous to those who employ it than was the low cost of the cheapest manual labour. Yet this industry is now driven "in part to Belgium." This ugly bit of news comes in as an unpleasant clincher on the foregoing remarks.

Another branch of the same great national question, which has not yet been brought forward in this part of the discussion, is aptly recalled to mind by the proceedings of the Socialist Congress at Ghent, reported in the *Times* of the 18th of September. After it had been "unanimously agreed, on Barry's motion, to offer fraternal greeting to the English brethren assembled in Congress at Leicester, on September 17th, 1877, and to commend to their friendly consideration the resolution adopted by the Congress of Ghent concerning the federation of trade-unions," it was resolved practically, with unanimity, as follows:—"Considering that trade-unions, in their struggle against the *exploitation* of man by man, constitute one of the most powerful levers of the emancipation of working men, the Congress engages all categories of working men, who are not yet organised, to form themselves into trade-unions, recognising at the same time that it must be the aim of the association to abolish the wages system." It is not at the Congress of Ghent alone that the guides and counsellors of the workmen have come to the resolution to saw off the branch of the tree on which they are sitting. At the Convention of the working men's party, at Cincinnati, reported in the *Times* of the 4th of September, it was resolved (13), "for the purpose of abolishing the wages system, all industrial enterprises to be placed under the control of the Government as fast as possible, and operated by free co-operative unions for the good of the whole people." What the Government control is to be is indicated in the ensuing resolution (14):—"That the constitution be so amended as to require that all officers of the General and States Governments shall be elected by a direct vote of the people." Who these officers and who the "people" are to be, is indicated by another resolution; *e.g.*, "the officers of these bureaux (for the compilation of labour statistics) to be taken from the ranks of the labour organisations, and elected by them."

Thus from Ghent to Leicester, and from Leicester to Cincinnati, the word has been given for a declared movement for the abolition of wages. It might have been thought that this would be the very last proposal which would have emanated from those who desired to be thought the friends of the working man. So grotesque is the project, that it is hard to understand its true meaning. We take it, however, to be this. In the existing state of things it has been found that certain informal associations, protected by law, but so spontaneous in their growth as to have attracted little attention as social phenomena, have sprung up all over the civilised world. These associations consist of one or more men of brains, together with a larger number of men of working ability. The men of brains, either as the fruit of their own talent and industry, or as the legacy of the talent and industry of those who have gone before them, have had the command of a certain amount of money. This they have employed to build workshops, to buy machines, to buy materials, and to support a certain number of workpeople till such time as the result of their combined industry could be brought into the market. Then, and then only, it becomes just self-supporting and actually profitable. When this latter time comes, the man of brains, having had the main trouble, risk, and care of the association on his shoulders, has generally taken the lion's share. And so long as men of this commanding ability are comparatively rare, and men of only ordinary or working ability are common, these institutions will flourish, and the disproportionate gains of the brain, as compared with the hands, will continue.

The hands, being discontented with the division of the spoil, propose to do without the brains. Thus, they conclude, all the profit will be divided among them; they will not, then, claim wages; that is to say, the fixed and certain support which they have been in the habit of enjoying. They will take upon themselves all the risk, and divide all the profit, of the business.

They leave out of sight the fact, that the profits which have made the man of brains disproportionately rich, would be a very small addition to the riches of each of the hands if divided among them. And, what is even more directly to the point, they take it for granted that they could contribute the brains as well as the labour. It is true that all efforts in that direction have for the most part hopelessly broken down. But what the workmen shut their eyes to is the fact that it is according to human nature that they must break down. For nothing can be more certain than that no association of human beings can make the best of their abilities and energy except under wise guidance and definite control. All history is full of the proof of this. All proverbial wisdom repeats it. "Too many cooks spoil the broth." The management of an army, of a factory, or of any great mass of men by a committee, is a certain road to ridiculous disaster. The first thing that the association has to do is

to appoint a manager. This manager must be either their servant or their master. If the former, if he is controlled by each member of the association, or by each member of a committee of the association, he is simply useless. He is only a bell-rope, without a bell at the end of it. If he is to do his work, he must be clothed with enough power to make every one obey him. In this case, how does he differ from the master, whom it is the object of the co-operative association to abolish? In many ways he really does differ. He is probably less educated, less able, less experienced. He has not grown little by little into his position. He has not had the salutary teaching of his own mistakes, made in small matters, and giving him wisdom as to larger matters. Above all, he has not the unsleeping spirit of personal interest, leading him to postpone leisure, to affront early looks, to encounter opposition,—in a word, to devote his whole energy to that success of what he indeed desires a large share of the benefit, but which is in fact the success of the association.

An instance within the personal knowledge of the writer, which occcurred about thirty years ago, may be cited with advantage. It was at the time of the early introduction of the railway system. An Act of Parliament had been obtained for a line between a commercial and an industrial centre of great magnitude. The greater part of the distance was singularly free from engineering obstacles. The line might have been let, in the ordinary way, to great contractors, for a very moderate sum per mile. But the engineer was not content with this. He was aware that great contractors made great profits. That they cou'd do so, and at the same time guarantee the company against great losses, did not enter into his calculations. Like the working men in the convention we have cited, he kept only one eye open. He persuaded the directors that if, instead of arranging for the work in the usual way, he was allowed to make directly, on behalf of the company, small sub-contracts with little men, as he understood that the large contractors did, he should save some 10 per cent. on the work. It is right to say that the honourable dealing of the man was past question. It was only a case of amateur or doctrinaire blundering. Small contracts were made, and in saying by thousands we are within the mark. The first contracts were let at unusually low prices,—5d. per cube yard for earth work, instead of 14d. But the 5l. work was soon done. The cream was soon taken off. Month by month new and more onerous contracts had to be made. At last, in one instance alone, a cutting,—which might have been let for 14d., but which was commenced at 5d., was finished at 3s. 6d. per cubic yard; the engineer being only too thankful to the large contractor who came forward and undertook to finish the work at that extravagant price. The excess over the original estimate caused by this attempt to economise was more than 30 per cent. This little bit of experience, familiar to the writer, is a fair specimen of what might be expected to ensue on the abolition of the wage system; or, rather, it is a favourable specimen. Late, but not too late, a man of iron will and brains, to organise and direct, was called in to knit up the ravelled threads. Had this not been the case, had the quasi-co-operative system been carried out to the ultimate close, the cost would have been far more serious than the large bill actually paid.

It is entirely baseless and false to say that the working classes lie under any artificial disadvantage in this country. The shiftless, the thriftless, the poor, either from their own idleness, or from inherited ignorance and thriftlessness, remain poor, or grow poorer. But the poor child who has in him the stuff of which a true workman is made, soon makes his way from the dust. Look at Stephenson! Look at the large fortunes that were made, when work was plentiful on railways, by great contractors, almost all of whom were men of very humble origin. We have seen cheques for thousands of pounds signed —we will not say by A. B., his mark, but by an autograph of but little higher order. These men possessed the rare advantages of an intimate knowledge of their own class, and of an intelligence above their fellows. By the latter they rose to positions of command; by the former they became organisers, providers, employers of labour. Rise was rapid. A man wielded the pick, or wheeled the barrow for a month or two. His steady capacity for work pointed him out to the master as a foreman, or to the men as a butty ganger. The butty gang made a good month's work. The writer has known as much as 17s. per man per day made by one of these associations. Nine of the men drank out their earnings at the end of the month. The tenth, whose wages came to a little more as ganger,—say 28l. for the month, banked his profits in a stocking instead of melting them in the alehouse. Two or three months of this work made a little capitalist. Boldly the man tendered for a small job. The power that some of these men possessed, without the knowledge of plans, or sections, or estimates,—of how much it would cost to do a bit of work, was instinctive. In two or three years the man—we could give names of more than one—was on a level to tender for a first-hand contract. In a little longer time he was on the way to become a millionnaire.

While some men who have made their money as contractors have been men of education, most of those who became rich on our railways were not. They were able labourers who rose to commanding positions in the army of labour. They did not pull up all their mates with them. That is out of the question. But they improved the status of the labourers as representative men. At the same time they were always stern and exacting masters. Whether very mild or very violent, they had the eyes of lynxes. It was in the wasted or well-applied minutes that they knew that profit was lost or won. These men, the commanders of the army of labour, risen from the ranks, are the first of those whom the resolutions of the Congress of Ghent, and the Congress of Cincinnati, would abolish and extirpate.

THINGS IN LIVERPOOL.

The annual picture exhibition at Liverpool, held this year for the first time in the new Art Gallery, includes a great number of works; and though hardly any of what could be called the leading pictures of the year seem to have found their way there, the average excellence of the collection is, all things considered, very high. If there is nothing brilliantly attractive, there is a large proportion of works of solid merit, and well worth looking at. The principal suite of rooms, on the first floor, the whole of which is occupied by the annual exhibition, is very successful in regard to the most important quality of a picture-gallery—good light. The ground-story rooms are unhappy-looking, cavernous and ill-lighted, and eminently unsuited for any purposes of exhibition. They are at present occupied, on the one side by works of art belonging to the Liverpool Corporation, and on the other side by a loan collection of Japanese ware and by the collection of paintings by Mignot, which were for some time exhibited in Bond-street recently. We understand that it is not intended to use these lower rooms permanently as picture-galleries; we presume the permanent collection will be transferred to the upper rooms when the annual exhibition is over. It is to be hoped so, for any attempt to see pictures properly in the lower rooms is out of the question; and although the corporation collection is of very unequal value, and would be much the better for some judicious weeding and exchanging, the works, good, bad, or indifferent, had better be put where they can be seen. Of the exterior of the building we gave a view some time since; it is further embellished now by two seated figures, of heroic, not to say colossal scale, of Raffaelle and Michelangelo, by Mr. Warrington Wood, which are placed on pedestals flanking the steps; as well as a fine allegorical figure of "Liverpool," by the same sculptor, which crowns the pediment. The figure of Raffaelle we cannot accept as a representation of the man as known to us in portraits; the head is quite deficient in the *spiritual* beauty which we associate with his name: as specimens of sculpture both figures are, we need hardly say, much above the mark of the decorative sculpture commonly associated with architecture in this country, and the figure of Michelangelo is treated with considerable power. That the figures look, nevertheless, unsatisfactory and uncomfortable, we fear cannot be denied; and it is worth while to note this and the reason for it, in connexion with the important subject of the combination of sculpture and architecture. The fact is, we take it, that Mr. Wood's figures are neither sufficiently combined with the architecture to be regarded as architectural accessories, nor sufficiently removed from it to be regarded as sculpture pure and simple. Their treatment fits them for consideration from the latter point of view; they are hardly conventional or quiescent enough to be regarded as accessories to the architecture. But they sit close up against the columns of the portico, to which they do not seem in any way to belong, and which they succeed in completely dwarfing as to scale. If it were intended to bring them into such close proximity with the architecture, they should have been made to appear more distinctly as designed for their position in the building, and the building as designed for them. As it is, they might, so far as appearances go, have been statues bought independently of the site, and placed where they are, merely because there was room for them. They might perhaps yet be removed further from the building, or be set in the space opposite the recessed wing, on either side of the portico, and, to our thinking, both building and statues would be the gainers.

While on the subject of architecture and sculpture on the site in question, we cannot but again urge what has been more than once brought forward in our columns already, the completion by the Liverpool public of their finest building (for so, with all its practical faults, it is), St. George's Hall, by the addition of the sculpture contemplated by its architect as the necessary completion of the building, and without which it is really unfinished. If the Liverpool Corporation wish to appear before the world as possessed of a real interest in the artistic beautifying of their city, the very first thing they ought to do is to make at least a commencement of the sculptural embellishment of Elmes's building, which has stood for a quarter of a century bare and unfinished,—a reproach to the town. The sculpture which has been added to the Art Gallery would have been far better applied to the Hall, where it would have been easy to find a place really fitted for it, because the Hall externally is designed throughout with direct reference to the combination of sculpture and architecture, by an architect who thoroughly understood the matter.

Next to the Art Gallery, the "Picton Reading-room" is now nearly completed,—a circular colonnaded building, with a low domed roof, which, however, only shows from a distance, the composition being crowned with a balustrade, and the dome set back. A circular building of this type is not very often seen now, and it has a pretty and unusual effect, though standing a little awkwardly between the square blocks of the Free Library and the Art Gallery, with the former of which it is combined. The Reading-room is not, like its neighbour, the Art Gallery, the gift of the gentleman whose name it bears, but was called after him as a slight acknowledgment of his having given something even better than money, namely, many years of intelligent and active assistance, as chairman of the Free Library Committee, in the ordering and improvement of the institution. In alluding to the Art Gallery as bearing the name of its donor, we speak literally, since the frieze is decorated, for the benefit of the inquiring visitor, with the words, "Walker Art Gallery," in enormous capitals. That is one way of doing it, no doubt.

Building operations in Liverpool take rather a railway turn just now, as two large stations may be said to be in progress. The one is the enlargement of the terminus of the London and North Western Railway Company in Lime-street, which is so extensive as to amount to making a new station as large as the old one alongside of it. How the new extent of street front is to be treated there is no sign as yet, as the majority of the houses that will have to be displaced are still standing; an immense amount of work has been done in enlarging the outlet from the station at the tunnel mouth, and the new platforms are laid, and the travelling stage for putting on the roof is in position. On the other side of the river the new station for the Birkenhead and Chester Railway, the connexions of which with main lines are now very extensive, is approaching completion, the iron roofs being nearly up. Birkenhead has long had a very dingy mean-looking incommodious terminus a little higher up the river than the new site, at the point known as "Monk's Ferry"; a name which, like "Blackfriars" on the Thames, recals the old history of the place in the monastic ages. The new terminus is being built close to the splendidly ordered and managed "Woodside Ferry," the property of the Birkenhead Commissioners (now to merge in the Municipality of Birkenhead), so that the main river traffic between Liverpool and Birkenhead will be concentrated at one spot, from which also the omnibus traffic into Birkenhead and the neigh-

bourhood radiates. The station buildings present nothing very special in the way of architectural effect: there is a certain degree of what may be called Gothic treatment, so far as the ornamental carving of capitals to pilasters, &c., gives a key to the style. Looking at the conglomeration of traffic here, and the provision for it, and at the dock-works, and Messrs. Laird's great shipbuilding-yard, which line the river on either hand, it is difficult to realise that within the memory of people now living this was a wooded river bank, with fields behind, to which occasional passengers were conveyed over from the Liverpool side of the river in a rowing-boat. There have been few such instances of rapid growth of a town in England.

The street architecture of Liverpool is gradually and bit by bit getting rebuilt, in the main almost entirely for the better; for, in truth, in the commercial parts of the town (not to speak of other neighbourhoods) the existing street architecture could hardly be more dull and uninteresting. Some new buildings in Castle-street, among the most recent, are very elegant, in a modified Italian style. At the corner of the same street appears the first bit, as far as we observed, of best genuine Revived Queen Anne that Liverpool has to boast of. This is the new building for Messrs. Agnew, the well-known picture-dealers, who seem to have been carrying out simultaneously in Liverpool a parallel building to that which has lately become a conspicuous object in Old Bond-street, London. We grieve to say that some Liverpool critics are profane enough to call this architecture, so much approved in the capital, the "Red-raddle style": a sad indication of the fact that—

"They do not know everything down in Judea."

The new Liberal Club, in Dale-street, is a large brick building, at present in little more than a shell state, and not sufficiently complete as to its front to enable one to judge quite of its ultimate effect; but, so far, we must confess, it appears to our eyes somewhat heavy in treatment.

The Liverpool Art Club have at present a collection of fans on view, containing some very interesting and pretty specimens, and with an intelligent catalogue. The collection is not, however, quite so large or important as the local press make it out to be. Messrs. Agnew have on view in their local gallery a large collection of fine impressions from the works of the veteran engraver Cousins, affording remarkable evidence of untiring industry and splendid workmanship, extending over a long lifetime.

THE ROMAN WALL BETWEEN THE FORTH AND THE CLYDE.

ITS ORIGIN: ITS PRESERVATION THROUGH THE DARK AGES: ITS PRESENT CONDITION, AND ITS PROBABLE FUTURE.

A STRANGELY neglected but really magnificent monument of the era of the Roman occupation of Britain stretches its silent length from sea to sea across the Scottish midland counties, in the wall of Antoninus Pius, built A.D. 140. It is magnificent not only when regarded from the standpoints of its original design and execution, but still more so in the fact of its present wonderful condition of preservation, after coming down to us through nearly seventeen centuries and a half of popular indifference (or ill-usage) and imperial neglect. From a variety of causes, which shall appear presently, this famous barrier — that once marked the north-west limit of the great Roman empire at a time when the river Euphrates did a like duty for it on the south-east—is but little known even to the dwellers in the neighbourhood of its route. It is, perhaps, familiar enough as a feature in the landscape to the rustics attached to the farms which the great military work bounds or intersects; but even to them its best parts are all but unknown, hidden as they are in the waste places and bye-paths of the country, and oftentimes shut out from the light of day, even, by a luxurious undergrowth of dwarf wood. The enthusiastic antiquary alone feels incited to the task of days of patient exploration in the depths of old woods, and across bogs and morasses; but he rarely possesses the youth and strength necessary for an expedition of this kind. The antiquarian fever does not commonly set in very badly until after middle age has been passed, when the knee-joints begin to stiffen, and by that time an exploration of the Scottish Roman wall, or any other enterprise of the kind, is out of the question, unless it is undertaken by proxy,—and, unfortunately, it is but rarely that such a proxy can be endowed with the observant eye and the understanding mind of the principal in the expedition. He who would become familiar with the most perfect parts of the grand old relic of which we are treating, must seek for them in out-of-the-way places which cannot be traversed, or reached even, except by persevering dint of leg exercise, varied by ever-recurring climbing and bush-ranging. If he have an awkward dread of being pinned in the leg by the dog of a stray gamekeeper here and there, or of being caught and laid by the heels for trespass, it were better that he should abandon the idea at once, and confine himself henceforth to explorations and researches which can be engaged in on pony-back at the least.

Known to farm people who cannot estimate its value, and but vaguely known to antiquaries, who have been obliged to found their conceptions on obscure hearsay alone, it has thus come to pass that a relic, perhaps the most generally interesting of which Scotland can boast, is now almost entirely neglected and ignored. The writer has duly qualified himself for the task by patient personal inspection, and he proposes to set down the results of his explorations, and of the speculations and conclusions to which these explorations have given rise.

Apart from the military roads and causeways with which the Roman engineers covered our island as with a net-work, the military rampart or barrier formed another distinct class of Roman engineering, of which the island of Great Britain offers no less than four specimens,—our present subject being one of them. The military barrier or rampart had for its general design and scope the barring of the way to the more civilised parts of the conquered territory, against the inroads of the aboriginal inhabitants from beyond the pale of subjugation. The history of this class of Roman work in Britain may be briefly sketched.

The Emperor Julius Agricola was the first of the Roman invaders who penetrated much into the interior of the country, and in his fourth campaign (as we gather from the narration of his son-in-law, Tacitus) he threw up a chain of stone forts across the isthmus between Bodotria and Glota (Forth and Clyde), for the purpose of securing and consolidating the conquests which his eagles had achieved in the northern parts of the island. This formed the first Roman barrier; and as at this crossing the country was entirely divided between forest and morass, it is almost certain that to supply the means of the necessary intercommunication, the eighteen forts thus thrown up were connected by one of those roadways for the construction of which the Romans possessed so powerful a passion. This chain of forts was begun and finished in the summer of A.D. 81; but it does not appear that the purpose for which the barrier was designed had thereby been accomplished, for we find a few years afterwards, that the Emperor Adrian, after some unsuccessful campaigns in the further part of the island, came to the conclusion that he must, in the meantime, rest contented with a frontier line further south, and accordingly in the year 121 he threw up from the Tyne to the Solway a wall of earth, strengthened by a deep ditch, and flanked with numerous garrison-stations, forts, and towers. But Antoninus Pius (surnamed the Father of his Country), who succeeded Adrian, gradually became discontented with the restricted boundary line to which his predecessor's Tyne and Solway wall confined him; and accordingly we discover him by his General, Lollius Urbicus, pushing the Roman eagles northward again, with the result that after a successful campaign, that general, by instructions from Rome, built a wall of earth from the Forth to the Clyde, in the line of the chain of forts which Julius Agricola had formerly constructed, but which, fifty years previously, the incursions of the aborigines of the northern hill country had compelled the Romans for a time to abandon. But a deadly canker was already beginning to attack the vital seats of the overgrown empire, and it is not to be marvelled at, therefore, that the attention bestowed upon the course and cure of comparatively trifling sores at the extremities should be but fitful and ineffectual. The wall of Antoninus Pius, though abounding in all the accessories usually added to defensive works of the kind, such as stations, towers, turrets, double walls, and a protected causeway for the swift massing of troops upon desired points, did not (as we learn from the writings of Julii Capitolinus) long remain an effective barrier against the inroads of the barbarians; and after seventy years of unsatisfactory struggle,—unsatisfactory because not adequately sustained by necessary reinforcements from home,—we find, for the second time, and this time finally, the Romans abandoning the line of the Forth and Clyde, to resume that of the Solway and the Tyne. The Emperor Severus, then in Britain, thus resolved reluctantly to relinquish all hopes of substantial conquest northwards, but in doing so he determined to erect, from the Tyne to the Solway, such a barrier as could not fail to secure the safety of at least everything to the south of that line for some centuries to come. Accordingly, in the year 209-210, the elaborate structure of mortared masonry, subsequently known as the Wall of Severus, was erected by that monarch between Bowness on the Solway, and Wallsend on the lower Tyne. Not that the abandonment of all the country to the north of this wall was final and definite. Probably a kind of fitful sovereignty was long afterwards kept up over the country situated between the Wall of Severus and that of Antoninus Pius. Indeed, Roman historians speak of various reparations of the Scottish wall,—one even so late as the fifth century; but it is at least open to suspicion that the work thus renovated was not the earthwork of Antoninus, but the more elaborate and later stone structure of Severus. Briefly these defensive works may be stated as follows:—

	A.D.
1. A chain of forts from the Forth to the Clyde, by Julius Agricola	81
2. An earthen wall and ditch from the Tyne to the Solway, by Adrian	121
3. An earthen wall, ditch, and military causeway, from the Forth to the Clyde, by Antoninus Pius	140
4. A wall of stone from the Tyne at Wallsend to the Solway, by Severus	210

It is with the third of these barriers we shall have henceforth to do.

Across the narrow neck or isthmus of land lying between the estuaries of the Forth and Clyde there stretches a natural valley, whose summit-level is comparatively low,—so low as to have induced in later times the construction through it of the large navigable canal known as the Forth and Clyde Canal. This valley pursues its course across the country in a tolerably straight line; but its concavity is interrupted here and there by the uprising of abrupt hills and hillocks, which, were the valley under a moderate depth of water, would stand up as some half a dozen islands and islets. Anciently, much, if not all, of the bottom of this pass from sea to sea was hopeless morass, while the lower slopes of both the northern and southern rise were covered with portions of the great Caledonian forest. This natural cut from sea to sea could hardly long escape the critical eyes of civil engineers so accomplished and so enterprising as the Romans were, and it cannot have failed to strike the earliest pioneers of Roman conquest in Britain as a line capable of the most thorough-going defence, if supplemented by those artificial accessories in which the Roman military engineers were so markedly adepts. The forts of Agricola (eighteen in number, and all still perfectly capable of identification so far as situation is concerned) hugged—to use a fitting nautical expression—the southern rise of the valley, and were generally erected at no very great elevation above the general level of the bottom of the plain. The sites were invariably chosen, however, for their commanding views to the northwards; sometimes they occupy the summits of the island-like hillocks which dot the general surface, and in fixing upon them it is evident that the Roman military engineers have not set much store by the preservation of a straight line. These forts were planted at intervals, roughly speaking, of two miles apart; and, as already conjectured, the military causeway, the remains of which are still in many places clearly visible, was probably built at the same time, although not finished, perhaps, to the extent afterwards attained when Lollius Urbicus carried through his *vallum* and double *agger*. The chain of forts, however, was but a small undertaking, when compared to the latter continuous barrier. Of this wall of Antoninus Pius (using the word "wall" in its comprehensive sense), the measurements put down at various epochs, and adduced by various authorities, are divergent and conflicting. But any one at all well acquainted (that is to say, personally acquainted) with the now obscure byeways which this relic of hoar antiquity pursues, can have no difficulty in accounting for so apparently curious a diversity of statement and opinion. The truth is, that the work was of various degrees of strength

and size,—a fact which is perfectly apparent to any one who will pursue the course of the trench at the present day. Along the entire length of forty Roman or thirty-seven English miles, to which the barrier ran, the strength of the line varies according to the natural surroundings of the country, and it would not have been like the finished strategists which the Romans undoubtedly were, to have expended unnecessary forces of defensive work on positions which were already well nigh impregnable of themselves. The vallum, or ditch, with its accompanying agger, on the southern brink, was continuous from sea to sea; but at some passes of great natural strength, the top width of the trench did not originally exceed 12 ft., while at other places of extraordinary exposure, it expanded into a huge rift of from 60 ft. to 70 ft. in width, and offering all the appearance of a sizeable ravine or small glen. Its depth also varied in like proportions, although that probably never decreased to anything under 12 ft., while at other points it may have been double or treble that depth.

We know that a force of nearly 8,000 men was employed in flinging up this great work, and although, unfortunately, beyond the memorial stones which each detachment of workers set up on the completion of the portion allotted to them, many of which are now to be seen in the University of Glasgow and elsewhere, we have no written memorial of the progress of the work, it is not difficult to conjecture how it was carried on. And although it is now 1,737 years since the work was executed, and nearly 1,500 years since it was given up to total neglect, we can tell, by means of the information conveyed by these tablet stones, by what regiments of the Roman army the work was executed, and how much of it each performed. If we reflect at the same time on the many national undertakings which have sprung into existence, fallen to decay, and sunk into oblivion complete and hopeless, during comparatively recent centuries, we shall be able the more sincerely to prize the little light thus thrown upon a great work which would otherwise have been mainly left in the region of conjecture. The amount of certain and probable data offered by these stones may be thus stated:—

	Paces.
Length constructed by the Second Legion	11,603
Ditto ditto vexillation of the Sixth Legion	7,411
Length constructed by the vexillation of the Twentieth Legion	7,801
Certain	26,815
Additional by the vexillation of the Twentieth Legion, probable, though not certain, owing to indistinctness of figures	6,911
The Sixth Legion, a monument, but no number, supposed	3,000
A cohort of auxiliaries (*Cohors prima Cugernorum*)	3,000
	39,726

or 39 miles 726 paces, which was probably the whole length of the wall.

From the eastern termination at Caeriden (the fort at the wing) near the modern seaport of Borrowstouness, the wall ran westwards at but a short distance from the sea-line of the Firth of Forth, at which place there is a somewhat steep rise of the shore. For half a dozen miles of this part of the track, until the comparatively modern town of Falkirk is reached, the line of the wall looked down upon the Firth of Forth, with, originally, a bleak strip of waste foreshore in front. This foreshore is now reclaimed into the highly-cultivated Carse of Falkirk, but it is still only a few feet elevated above high-water level, and at the epoch of the Roman invasion it was undoubtedly a swampy region of half sea, half land, with the deep Firth as a background, and the whole forming a tolerably sufficient barrier against the incursions of the wild natives from the opposite shores of Fife and Clackmannan. We are not astonished to find, therefore, that the artificial wall was here of about its smallest dimensions; and, indeed, so small has it been, comparatively, that but very slight traces of it remain for as much as four or five miles from its eastern termination. For this portion of the works we can imagine much of the excavating tools and the greater part of the provisions for the workmen must have been landed from the imperial galleys anchored off the Ness of Borrowstoun, where water comparatively deep is found closer in-shore than at any other point for some miles, either up or down.

Four or five miles farther up the Firth, the River Carron joins its waters to the larger estuary at the modern port of Grangemouth. The Carron is still navigable for a considerable distance from its embouchure, but in the time of the Romans it was navigable for a much larger part of its course, and at the ancient port of Camelon (the site of which is now at a considerable distance from the highest point which even small ships are able to reach), where the river takes a bend to the southwards and approaches to within half a mile of the line of the wall, it amounts to a clear certainty that the Romans had their second shipping station for the discharging of the men and material required in the construction of the wall. Many Roman remains have been found at ancient Camelon (the modern village does not occupy precisely the same site), and, amongst others, the anchors of some of their galleys have in recent times been dug up. Now, long anterior to the rise of modern navigation in this country,—at least, long anterior to its rise above the stage of wicker coracles or dug-out canoes,—the gradual upheaval of the southern coast-line of the Firth of Forth, along with the vast accumulations of sedimentary deposits by the Firth itself and by its numerous turbid tributaries, totally rubbed out Camelon from all floating communication with the sea. The position is therefore incontrovertible that the anchors thus dug out of the deposit are those used by the Roman galleys which frequented the upper Carron and its port, Camelon, during the construction of the wall of Antoninus Pius, and also during the period immediately following, during which it was maintained and upheld as an effective military barrier. A military causeway, of finished construction, the remains of which are still visible, stretched from the port of Camelon to the vallum, at a point about a mile and a half to the westwards of the spot where the town of Falkirk now stands, and there joined the lateral military causeway which accompanied the wall along the whole length of its course, from sea to sea. Camelon, also, as an advanced post to the northward of the wall, and as probably the most important Caledonian harbour which the Romans possessed, was elaborately defended by stonework, which, so recently as the time of the Scottish historian, George Buchanan (middle of the sixteenth century), showed ruins so extensive as to give rise to the assumption that Camelon had been a Roman city of grand dimensions. The stone relics of ancient Camelon, however, like all the rest of the open stonework of the Romans in this part of the country, have long since utterly disappeared from the immediate neighbourhood of the site where they once stood erect; but many of them may still be traced in incongruous positions in the rude structures of the cottages of modern Camelon, in the stonework of farmsteadings, and in the stone fences of the farms themselves.

As Lollius Urbicus and his sappers and miners worked their way westward from the base of supplies which the port of Camelon constituted, they began to feel that they were now in the tug of war. Directly to the northward, an exceedingly level and therefore very dangerous country presented itself for the incursions southwards of the savage but warlike tribes of the trans-Grampian region. The comparatively puny dimensions with which the wall and its appendages had started from its eastern end at Caeriden now no longer sufficed; and accordingly as it proceeds to the westward of Falkirk the vallum becomes wider and deeper, while the agger on the south brink becomes broader and higher, and it is not unnatural therefore that it is here that we now find the great work in its highest state of preservation.

It is at least doubtful whether even a mere pretence of an agger on the north brink of the ditch was ever carried unbroken from sea to sea; but at this portion, at all events, such a thing *was* considered indispensable; and when complete at this point, the north agger must have vied in dimensions with its *vis-à-vis* on the south.

Simultaneously with the construction of the rampart from its east end, doubtless began the same work at its western extreme point, where it strikes the shores of the estuary of the Clyde. Here, in the neighbourhood of Dumbarton (for it is still a moot point whether the wall terminated at Dumbarton or at another point jutting into the water a little farther to the eastwards) the Roman galleys would find a safe mooring-ground for the landing of the implements and stones involved in the construction of the major portion of the western half of the wall. Thus working from both ends and with a heavy force of military artificers at command, the full stretch of the distance involved must have been accomplished in a space of time which, to those who have been accustomed to witness such operations on no greater a scale than that demanding the presence of a few hundreds of unskilled navvies, must seem incredibly short. We have nothing, on the point of time, to guide us but inference; but bearing in mind to what a high perfection of efficiency and rapidity the Roman engineers had elsewhere attained in the throwing up of intrenched camps, and such like, it can hardly be asserted that the Caledonian rampart occupied in its construction more than one calendar month, while some critics,—professing to judge solely from the time occupied in the construction of similar works, regarding which we possess an abundant supply of data,—incline to the opinion that a fortnight may have sufficed for its completion. There was unquestionably a spirit of emulation at work amongst the various divisions of the Roman army sent from Italy to do this bit of civil engineering on the remote north-west frontier line. We can gather as much from the inscriptions on the tablet stones which were set upon the face of the wall by each division as their portion of the work was finished; but, independently of the spirit of ordinary emulation, there was probably a more peremptory necessity for rapidity of execution, viz., that of danger from the warlike tribes to the northwards, if time were given to them to descend in anything like numbers upon the work and the workers before the finish was fully reached.

The course which Lollius Urbicus took with his barrier was, generally speaking, along the southern slope of the great valley of which we have spoken. His orders from Rome evidently were to fetch up each of the forts of Agricola in turn, and this was an injunction which must have cost him no little scheming and trouble. But for the fancied necessity of catching up these forts, a much more advantageous route for the great wall might have been selected than the somewhat erratic one which it actually pursues. We find it constantly dipping down to one of the lower-levelled forts, or again reaching up to one of those planted at a higher level. It takes also some curious turns and bends even between the forts, for the purpose, doubtless, of avoiding very hard rock, or a soil of a softness incompatible with the degree of durability which was considered indispensable. At one point the wall comes down very close to the lowest dip of the great valley, for the purpose of catching up a fort situated at an unusually low level. During much of its course it must in ancient times have skirted the southern brink of the morass-land which, to a great extent, occupied the bottom of the valley. It intersects many brooks, and some considerable streams, but by what means these were crossed, if crossed at all, it is impossible definitely now to say. No vestiges of any bridges are to be found, although if such ever did exist they would have been very much liable to be carried away during heavy rains or after severe snowstorms. The probability rather is, however, that the difficulty therein experienced by Lollius Urbicus was overcome by simply leaving the requisite gap in the works. Where very small runlets were intersected, little drain-conduits of masonry were introduced; and as the ditch is nearly always following the deviations in level of the surface, its bottom, though most commonly quite dry, sometimes became itself the course followed by the surface drainage. The theory that no bridges were used is strengthened by the fact that wherever a sizeable stream is to be intersected, the rampart invariably strikes the water at a point where the bank of the stream had become precipitous, and therefore impracticable for the maintenance of foothold by any enemy who might form the intention of using the water gap for the purpose of making a hostile incursion southwards of the barrier.

At the first blush it might have been fancied that a work into the construction of which so friable a substance as that of earth, or even turf, almost solely entered, would prove but ephemeral, unless being constantly looked to by gangs of engineers, and having instantly remade any observable breaches caused by the slow operations of unaided time, by the weather, or through the destructive propensities, or love of change, of the two-legged agencies upon its borders. Such a fancy is badly founded, however. Doubtless the wall of Antoninus Pius has suffered, and suffered severely, through each and every of the agencies just quoted; but what there is left of it may give thanks for its present wonderful state of preservation to the fact that it was built of soft friable earth, and not of hard durable stone. Many grand portions of this fine old relic are preserved almost intact,

SECTION OF ANTONINE'S BARRIER WHEN PERFECT.

The dotted line shows its present contour at well-preserved portions.

save from the beating-down and filling-up tendencies of over seventeen centuries of the variable weather of North Britain; but if the structure had been solely of stone, it would have gone the way, long ere this, of all the early stone-work of countries which pass from one great civilisation to another with a gap between of some centuries in width of utter barbarism and neglect. Not that there enters no stone whatever into the construction of the wall of Antoninus Pius, but what stone there is is hidden, and has, generally speaking, remained so, except to the spade and probing iron of the explorer. The plan of construction seems to have been as follows:—

A survey of the surface from one fort to another having been made and a route fixed upon, a squad of soldiers with proper implements pioneered the course by clearing of trees and brushwood a sufficient width to admit passage for the military causeway, the vallum or ditch, the south agger and its smaller companion on the north. Immediately on the heels of this trenching party followed a squad of masons, laying down a surface foundation of freestone for the reception of the earthen agger, while last of all came the main body of the workers, excavating the great ditch, and heaping up the *débris* thereby won upon the stone foundation being laid down in front. Only a few weeks ago, the writer inspected a small portion of this foundation which has just been laid bare for inspection by the intelligent proprietor, about two miles to the west of the town of Falkirk, and at a place where the barrier approaches to within a few yards of the banks of the Forth and Clyde canal. The foundation now exposed proves to be of rough blocks of freestone, most of the blocks bearing marks of having been broken off from the parent strata by the agency of wedges. These are laid in without any cement, and they form one course only of from 14 in. to 18 in. in thickness, and with a uniform breadth of 14 ft. The earthen wall, though of course much flattened down by rain and other influences, still stands 6 ft. high in some places closely adjoining, and although the stone foundation is on the same level as the neighbouring surface of the untouched ground it is everywhere concealed from view. Directly adjoining this little bit of exposed foundation, the great vallum itself yawns in almost unimpaired perfection with a breadth at top of 40 ft. across, and a depth from the now depressed summit of the agger of 25 ft.

Antoninus's wall, therefore, owes its present wonderful state of preservation to the fact that it was built of earth, and not of anything to try very severely the cupidity of the many generations of needy dwellers upon its banks and in its vicinity. For many centuries, too, the work was buried within the recesses of a primeval forest tract in a region barren and thinly populated; and to this, also, is doubtless owing much of that immunity from wanton outrage which it has enjoyed. Its value as a defensible military rampart must in those days have been very high, though it is very questionable whether the Romans were ever—for anything but a short period comparatively—in a position, because of troubles at home, to do its qualities in this respect justice. A critical inspection of the military work at the present day affords evidence of not a little intelligent appreciation of the relic on the part of land proprietors even in times somewhat remote. There may be found here and there very fine bits carefully enclosed; while on either side a high cultivation comes close up to the very brink. In some places the ground has been ruthlessly levelled by the unappreciative rustic; but so gigantic have the various works originally been, that hardly in any place, except where the site is now covered by the streets and buildings of a town, is it totally impossible for the knowing eye to catch up a few unobliterated traces.

To the inhabitants of the Forth and Clyde valley the barrier is known as the Roman wall, Graham's Dyke, and Graham's Sheugh. By one or another of these three names it is known pretty extensively by hearsay; but there is little of intelligent interest in the relic to be encountered anywhere amongst the natives, many of whom have never even had the curiosity to go and see a bit of it. A few miles of the barrier are still quite intact; and nothing for the intelligent and appreciative mind can be more impressive or even solemn than a visit to one of these copse-hidden retreats. In many places we have the work in a condition pretty much that in which Roman spade and mattock left it more than seventeen centuries ago, the sides of the great trench clean cut still, and the southern agger quite distinct, though weather-beaten down to half its original height. More frequently this agger has been clean cut away to admit of the plough coming right up to the brink, and in a very few places the huge rift has been carefully refilled and levelled. Here and there, along the route, a low stone wall creeps along the bottom of the trench, and forms the march line between one property and another; in some level places water filled to the brim has occupied the ditch for ages, while in others soft and spongy moss has crept down into its bed and partially filled it up. In one or two places the ancient reclaimer of the ground, loath apparently to obliterate all traces entirely, but more unwilling still to lose, purely from excess of æsthetic motive, so much valuable space, has rounded off the brinks of the vallum, and boldly ploughed down one side of it and up the other, thereby cropping the whole without injuring much the relic itself. That such a thing *can* be done will be proof of itself, to the practical surveyor, of the very considerable proportions of the original work. In portions of its track it assumes very much the appearance of a modern railway cutting permitted for some reason or other to run wholly to seed. Wherever the trench has not been much molested, trees and shrubs now spring up from its bottom and from its sides; and wherever this occurs, the thing looks so thoroughly natural and ravine-like, that even the most intelligent stranger accidentally crashing through the brushwood and suddenly presenting himself on the brink would naturally turn away as from nothing remarkable. Where the wall passes through demesnes of very old standing, such as notably in the case of Callendar Park, near Falkirk, a part of it is usually carefully preserved. Where the site passes through a country thoroughly cleared and open, its course may almost invariably be traced by a more or less gentle lateral concavity of the surface, and by the sudden dip of the stone dykes and hedges which traverse it at right angles. In the neighbourhood of the rising town of Falkirk, the south brink of the vallum has become a favourite site for the erection of modern villas, the owners of which are drawn thereto partly by the attraction of historical association, and partly by the magnificent view to the northwards which the summit of the wall affords to the spectator along the whole of its course. The route of the rampart through the Scottish midland counties has recently been discovered to be abounding in mineral wealth. The prosperity to which this gives rise is growing apace, and any day may see the finest parts of the glorious old relic sacrificed to the unintelligent indifference of a go-ahead coke-burner, or to the race after wealth of an enterprising ironmaster, who know little and care less concerning the Antiquarian Society. Where the rampart approaches to within five miles of the already great and still swiftly-growing city of Glasgow, much of it has of late years been mercilessly wiped out by clusters of *parvenus* suburbs, by new street-lines and roadways. The great wall of Antoninus Pius is not yet so dilapidated but that it may legitimately be regarded still as a grand whole. Any explorer, with a knowing eye for its fading points, may yet trace it from sea to sea without encountering more than a mile regarding which he has to appeal either to local history or tradition for assistance in identification; but, undoubtedly, without the aid of some legislative conservatism, our descendants a hundred or even fifty years hence will not be able to say the same.

Possibly, if Sir John Lubbock's proposal for the preservation of national monuments should fructify anything bountifully, something may be done to ward off the complete obliteration of the great work of Antoninus, as well as of many other works of a kindred nature. If it be objected that Roman remains are not, strictly speaking, national remains, it may be answered that precisely the same objection may be raised against Druidical, Celtic, Danish, Anglo-Saxon, and Norman relics. Moreover, there is still a slight trickling of the blood of Romulus and Remus in our veins, and one may very safely venture to assert that that same trickling is not the most ignoble part of what is a very fine blend,—if we may be pardoned for saying so. But there is another avenue open for at least a partial alleviation of the calamity threatened, should there be no prospect of imperial interference of a salutary kind. There are many intelligent land proprietors between the Forth and Clyde through whose grounds fine portions of the old wall run. If one or more of these gentlemen will restore a short strip of the rampart to its pristine condition when Lollius Urbicus with his sappers and miners left it nearly seventeen centuries and a half ago,—if they will enclose this renovated portion along with an adjoining untouched part of equal size, and take such steps for the preservation of the whole in perpetuity as their various sagacities may suggest,—we venture to assert that in doing so they will not be performing the least meritorious act of their lives.

EGYPTIAN ARCHITECTURE AND ITS EXPRESSIONAL POWER.

It happens, perhaps fortunately, every now and then, that some fortuitous circumstance or event occurs which attracts an amount of attention to some art or science, or special phase of it, which would not otherwise be accorded. It is so most certainly in fine art and in architecture, for the accidental discovery of some mere fragment, perhaps, of an antique and forgotten, or well-nigh forgotten, style of architectural art, will draw the attention of the art-loving world to matters all but passed away, even from remembrance. We could name many such, but it must be needless. We would revert to it simply for the purpose of calling a moment's attention to a style of art and architecture which but seldom comes into "practical" consideration, and but rarely into the artistic thought of more than a very few. We allude to the *Egyptian*,—to that style of art and architecture which once on a time prevailed, and had sway over so large an extent of country, and was the *sole* mode of artistic and architectural expression then and there in vogue. This may at first glance seem somewhat common-place, and to suggest but little that is not now well known; but it is not so, and the appearance in the modern Babylon, in the open air, and always exposed to public view, of a genuine specimen, and not a copy, of antique Egyptian art, may well raise in the minds of the thoughtful few some, and not a few, novel thoughts. Old Egypt borrowed nothing and copied nothing, not even her own work.

The obelisk now on its way, and a model of which, to show its exact size, stands in Parliament-square, close to the Gothic walls of Westminster Abbey, would now in the proposed site, if unfortunately it were allowed finally to stand there, puzzle not a little its architect and sculptor; hardly less so, may be, than would the Abbey itself and the Palace of Westminster, and its towers round about it. He could but call to mind its antique place and position and use, for it assuredly had one. He might, perhaps, even be thought to ask where the "Temple" itself was, of which it formed a component, though but a small, item, and to wonder why a part at

least of it was not near it, thus to show its antique significance!

It may, therefore, be of some interest to glance for a brief moment at an ancient Egyptian temple, its arrangements, and at the special place in it which the obelisk commonly occupied. If the obelisk be placed in Parliament-square, if it be not surrounded in veritable fact by the architecture and accessories which it had when in its original place on Egyptian ground, it may be useful to bear these in mind while looking at it, and may help to render it an object of yet greater and more profound interest than it is likely otherwise to be. An obelisk always formed part of what may conveniently be termed the furniture of a temple; just, indeed, and as much so, as the furniture in it forms a part of a church nowadays. It must, therefore, be of interest to have some general idea of what an antique Egyptian temple was,—its general plan and arrangements, as far, indeed, as these can be come at after so many ages have passed, and so much beyond hope of recovery has perished, even to the very memory of it.

Not to speak of the religious ideas of the old Egyptians, it may be noted that one great leading idea which must have always been present to the mind of an Egyptian architect in the planning of a temple was to provide adequately for the passage and display of those long and gorgeous processions of which the Egyptians were so particularly fond, and which played so important a part in their ceremonial worship. Within a grove of trees, wall-surrounded, the temple was placed, and was approached by the procession through a somewhat low doorway in this outer and protecting wall of it, after having passed, at some distance from it, through an open portico, an arrangement not a little conducive to the effect desired to be produced. We are here speaking of the larger and more imposing and perfectly-arranged temples, the details differing and the parts becoming fewer as the temple diminished in size and importance. After passing thus through this first doorway, comparatively low and narrow, the procession saw before it, may be, the most generally imposing part of the entire structure or group of buildings,—the first "pylon," sculpture-covered, with its central gateway, through which it must needs pass. On either side of the central pathway or avenue along which the procession passed were rows of sphinxes, more or less in number, and between the ends of these lines of so strangely animated forms and the pylon stood the emblematic obelisks, for there were two of them, one on either side of the pylon doorway, and close to it, as lamps standing before the portico of a London church or public building. They were thus seen profiled against the pylon wall, and cast their long shadows on it, and more effectively and judiciously they could not be placed. May not this consideration among others afford a hint in the selection of a position for this London obelisk?

But to our outline of the Temple arrangements, from which obelisks come. Before the pylon, and near the obelisks, were the seated Colossi, of which busts and fragments may be seen in the British Museum, and these formed certainly no insignificant part of the imposing architectural picture. Much more here might be hinted at, but we are simply indicating plan and arrangements. Beyond the first pylon was a second one, with all but the same arrangements, though differing in details. A court-yard, a striking part of an Egyptian temple, with open-columned covered ways right and left, followed. There were flagstaffs here as before the first pylon, with banners. Through the narrow gateway of this second pylon we come next to a second open courtyard, or cloister, we might almost term it, like the first, but in front, instead of another pylon or gateway, there was the *entrance* to the temple itself,—a vast square or oblong of columns, covered with hieroglyphics and emblematic devices, bounded by solid walls, and covered over by a flat roof. It is rather an excavation than a building, and the probability is that the original idea for it came from the rock-cut caves so common on the banks of the Nile river. Within this strange and darkened temple was the inner sanctuary, containing the statue of the divinity or "attribute," to which the temple was especially dedicated. We know but little or nothing of details beyond what can be got from the hieroglyphics, and from an occasional antique historic note, but there is enough to make generally intelligible the uses to which an Egyptian temple was put, and to learn,—which is the great lesson to be learnt from a study of it,—how the architecture and sculpture of it *grew up* out of necessity, and that all and every part and detail had a practical use and symbolic meaning and import which made of it an ever-open book!

We must not omit to mention that a large water-tank occupied a considerable space in the *grove* of trees surrounding the temple. And may we not here usefully glance for a moment at that special faculty through and by which the old Egyptian did so many of his greatest works, and which compelled him to feel satisfied and pleased with such simple lines as those which bounded the pylons of his temples, his pyramids, and obelisks. No people, certainly, who ever existed have surpassed, or even equalled, the ancient Egyptians in the power of expressing the sublime in architecture,—an art expression to be seen and felt in architecture, but hardly to be explained in words, however carefully chosen or cautiously used. It is only, therefore, by actual observation and long looking at and study that it can be duly seen and appreciated, but a timely word may still help. Nothing can well be simpler than the bounding lines of this very obelisk standing on its simple platform of steps as it originally stood. No "ornamentation" of any kind interfered with the simplicity of its outlines, the "hieroglyphics," or, in plainer language, the hand-writing or inscription on its plain faces, not interfering in any way with its outline. As an architectural feature, to use a convenient word, it would be hard to surpass it in simplicity and grandeur of expression. It is enough in itself, and does not need any of those incongruous additions which have been but too often made to it. The might of Egyptian work comes of its very simplicity, and, we had almost said, obviousness of expression. It speaks for itself!

There is another element, among many more, in the architecture of Ancient Egypt, which served to make it expressionally grand and imposing, viz., the fewness and plainness of its minor parts and details—details which went to make it up after the simple outlines were drawn. Nothing but hieroglyphics on the obelisk, nothing but equally simple flat outline drawing on the pylons and walls, scenes and memories of its past history and famous deeds. The crowning cornices and wall cappings are but plain curves and beadings, and the whole rises from the ground or area on which the building stands in the plainest possible way, the grand and massive outlines doing all the work—artistic outlines, if ever there were any such, with strong effects of light and shade. And the columns, too, what can be simpler? and the capitals, how few the parts which compose them, all depending on the majesty of outline, and power of drawing, and, it may be added, consummate excellence of work by the art-workmen who wrought them. And a great, a very great lesson, indeed, is here to be read. How little power has even originality and capacity of design if it be not followed up, and embodied in excellence and power of workmanship? Very much more might be added, for rarely has the hand of man made so fine and durable an impression on the formless materials provided for him by nature as in Egypt.

ST. GERMAN'S CATHEDRAL, ISLE OF MAN.

The desire to restore decaying ecclesiastical buildings which is so marked a feature of the present day has extended to the Isle of Man. The Cathedral of St. German is here its object. The cathedral itself gains in interest just at the present time, when public attention has been lately attracted to this spot by the recent appointment of a new bishop to the ancient see of Sodor and Man, whose consecration has just taken place. The building is dedicated to and called after one St. German or Germanus, of whom tradition with great exactness relates many things which at the present day may be noted with interest, but not with any particular belief in their truth. It is said that German was the first bishop of the island in A.D. 447, and that he was sent to the island by St. Patrick, or left by this converter of the heathen, to carry out the work which the latter had begun. But, as a matter of fact, it is now impossible to say who Germanus was,—whether there ever was such a person,—though the mere fact of a cathedral being dedicated to such a saint shows that a person of that name must in some way have been connected with the ancient Manx church.

Let us, however, touch briefly on the actual building, leaving its patron saint the reputation with which tradition has endowed him. As an architectural structure, St. German's Cathedral is in no way remarkable, it has no intrinsic beauty of detail or grandness of mass, such as we witness in so many ecclesiastical buildings. But its situation is remarkable and striking, and very fitting for the metropolitan church of a sea-girt diocese. It is built on the island of Peel, within the walls of the old castle, and side by side with turrets and guard-houses. This islet is a mass of rock rising above the town of Peel, and connected with the main land only by a narrow wall or breakwater, barely wide enough for two persons to pass along. Thus it stands, overlooking the wide bay of Peel, which is encircled by the far-stretching point of Jurby on the north-east, and is ended on the other by the rocky island on which the cathedral is placed. On a bright summer day there is no sight more picturesque or characteristic than to see the scores of brown-sailed herring-boats beating out of the bay and dancing on the bright waves beneath the ancient shrine. But it requires, on the other hand, no very vivid imagination to picture the cathedral enveloped in the clouds of spray from the Atlantic waves broken against the rocks in a stormy night in winter. The cathedral is cruciform in shape, without aisles, and consists of a chancel, north and south transepts, with a central tower and a nave. There has apparently been a south aisle; for whilst the northern wall of the nave is an ordinary wall with ordinary windows, on the south there are three arches, with rounded pillars as the present boundary. The building has been formed of the common grey stone of the island very roughly worked, whilst the pillars and facings of the windows have been made of red sandstone, which is now much decayed and worn by the weather. The building is supposed to have been commenced by Bishop Simon in 1229, and the chancel, the earliest part, shows clear signs of the Early English style in its three plain lancet windows at the east end, and the same kind of windows five in number on each side. At some subsequent time the floor of the chancel has been raised for the purpose of forming the crypt beneath, which is noticeable for its ceiling composed of broad flat ribs springing from pillars with broad square capitals. It was in this dismal cell that various ecclesiastical and political offenders, both Manx and English, were confined. Here Eleanor, Duchess of Gloucester, was, in 1447, placed for the rest of her existence, and condemned to live, as Shakspeare writes,—

> "In banishment
> With Sir John Stanley in the Isle of Man."

The nave and transepts belong, it is supposed, to a somewhat later period than the chancel, though the windows have, from time to time, been altered, so that they are very little test of the age of the building. The pillars of the tower are square, with the edges flattened, and built into the wall. As we have already said, there is absolutely no detail in the building; the square tower rises simply above the grey edifice beneath, and the ruined battlements of the south transept give it, from one side, the appearance rather of a warlike than an ecclesiastical pile. But it is in harmony with the surroundings of nature, the green, bare hills, the cold rocks, and the wide-stretching Atlantic.

As time has gone on, the building has grown more ruinous. When Grose wrote his "Antiquities of England and Wales," in 1773 and 1787, part of the roof was still remaining, for he speaks of it as being "now externally ruinous, much of it unroofed, and the remainder so much out of repair, that it would not be over-safe for a congregation to assemble in it." In 1859 subscriptions were collected in order to prevent this time-honoured building from becoming completely effaced, and at the commencement of the present year a more vigorous attempt at actual restoration has been made under the superintendence of Mr. Anderson, the architect who has had charge of the Iona and Jedburgh restorations. The work is now apparently proceeding with some activity, and as there is absolutely nothing to be done but to replace very plain work, or to repair old work, there seems to be no reason why, with patience, St. German's Cathedral should not be completely fitted for its original purpose as a cathedral church. There is something wanting to the proper fitness of things when a diocese does not possess a cathedral church, and though St. German's cannot be considered as in any way

remarkable for beauty of form, it is a characteristic structure considered in regard to the place where it is erected and the place of which it once was the chief church, and to the particular portion of British ecclesiastical history with which it is so closely connected. With general ecclesiastical history it may also be said in many ways to be allied, since the prelates of Sodor and Man have numbered among them men so well known as Lake, afterwards Bishop of Chichester, one of the non-jurors; Isaac Barrow, and Bishop Wilson.

We append some dimensions which may add to the usefulness of this sketch:—Length of chancel, 36 ft. 4 in.; of the nave, 52 ft. 3 in.; of the tower from east to west, 25 ft. 11 in.; total length of interior, 114 ft. 6 in.

SCIENCE IN THE TRENCH.

An interesting discovery, and one which may, perhaps, lead to important results in geological speculation, has recently been made in carrying out some excavations for a new dock at Penhouët, near Saint Nazaire, at the mouth of the Loire, an account of which, abstracted from the last number of the *Revue Générale de l'Architecture*, will, we think, be interesting to our readers.

It appears that as far back as August, 1875, M. Kerviler, the engineer in charge, from the number of human bones, bronze arms and utensils, fragments of pottery, &c., which were turned up at various depths during the process of excavation, became convinced that he was working on the site of an old seaport, once inhabited by an ancient maritime people of Gaul, of an age in which polished stone implements were used contemporaneously with those of bronze. At a later date this seaport, the position of which is marked by the bay or creek of Penhouët, was the Corbilo of Polybius, and afterwards the Brivates Portus of Ptolemy. For a time these discoveries were interesting only from an archæological point of view, but an attentive study of the nature of the silty deposit in which the various remains had so long lain hidden started M. Kerviler on a track of the highest scientific importance, and which, as we have above stated, may lead to very valuable geological and palæontological results. Up to the present, although science has been able unhesitatingly to fix the order of succession and relative ages of the strata forming the crust of the globe, still a positive estimate, anything like a rigorous determination of these ages, expressed in centuries or in hundreds of thousands of centuries, remained a matter of conjecture.

Taking, for example, only the most recent epochs, those within which the quaternary strata and modern deposits must have been laid down, calculations by geologists of the greatest authority give figures, the exactitude of which must be considered more than problematical, since though merely relative, the dates suggested vary in the proportion of *one* to *ten*. The observations, however, of M. Kerviler, allow of a much more exact determination of the time necessary for the deposition of the strata in question; up to a certain point, indeed, such determinations may be made with mathematical rigour.

The facts are as follow:—Mr. Kerviler noticed the vertical face of a cutting about 25 ft. deep, exfoliated uniformly under the rains and frosts of the past winter in a series of thin laminæ of a mean thickness of 1-10th of an inch (3 millimètres). An examination of these thin beds revealed that each of them represented the various matters brought down by the rivers Loire and Brivet in the course of a year. Each bed was found to be invariably made up of three layers, superposed in regular order,—one vegetable, one clayey, and one sandy, representing beyond all possible doubt an autumn deposit (*i.e.*, the fall of leaves), a spring and summer deposit (*i.e.*, when the greater quietness of the waters is specially favourable to the deposition of a clayey sediment), and a winter deposit (when storms and floods load the stream with sand torn from its banks). The number of the beds, then, between any two points is an index of the number of years which must have elapsed while that depth of deposit was accumulating, just as the age of a tree may be determined from its concentric rings. There is nothing hypothetical, — no guessing: the age can be settled rigorously. M. Kerviler has determined in this way the age of the Gallo-Roman deposits to which we have referred, and the date he fixes corresponds with that furnished by history: the end of the third century of our era (between 280 and 300). The bronze swords discovered at a depth of about 6 ft. below the Gallo-Roman remains must date back to about the year 450 B.C.; but we have not yet reached the commencement of this new sort of almanack, for by sinking numerous shafts and borings, M. Kerviler has ascertained that for a depth of over 60 ft. below the position of the bronze weapons, down, in fact, to a bed of flints which rest on granite, the annual layers continue, and the deposit is, in fact, sensibly similar to the upper part, as we have described it. The commencement of this recent epoch is thus fixed at 8,000 years ago, say 6,000 years before the Christian era.

These conclusions are unquestionably of very great interest, and we as Englishmen may feel a certain satisfaction that it was M. Waddington, as Minister of Public Instruction, who placed funds at the disposal of the engineer for the sinking of shafts, &c., for carrying on the investigation after he had so cleverly seen what many men would have passed unnoticed. At the same time, the conclusions must not be pressed beyond their legitimate consequences. In this case, for instance, we can only say that the deposit in question was commenced 8,000 years ago, but the rivers may have then changed their courses, and may possibly have carried down silt and *débris* to their *embouchures* through long preceding ages. This consideration, however, in no way detracts from the value of the discovery, and its method is, we think, likely to be fruitful of results now that it has been suggested to geologists. It is of importance, at least, in fixing a minimum to any formation; and is a striking instance of the way in which pure science and the ordinary pursuits of life may forward and benefit each other, while it seems to us to furnish an unanswerable argument in favour of science being more generally included in what is called a liberal education, especially in the education of those who follow the professions with which we are more immediately concerned.

BRIGHTON SCHOOL OF SCIENCE AND ART.

The distribution of prizes to the successful students took place in the Dome on Thursday, the 4th inst., the Mayor presiding. Dr. Carpenter, F.R.S., who presented the prizes, and made a lengthened address to the meeting, commenced by saying that he knew nothing about art. He was so good as not to say exactly that he was proud of this ignorance, as some eminent speakers have said before now, but still said, in a pleasant and jaunty tone, that he knew nothing about it. A number of prizes were given, and there was a considerable flourish of trumpets, to which we should have attached more importance, probably, if we had not happened to visit the collection of works of art (save the mark!) set forth in the commodious new school building, illustrated some little time ago in our pages. With some few exceptions, the specimens exhibited were of a very indifferent character, and would have done no credit to a Peckham boarding-school for young ladies. Looking at this exhibition in connexion with the following summary of the "balance-sheet of the working account," the result seemed melancholy indeed:—

"Dr.: Balance, August 1st, 1876, 221*l.* 9*s.* 8*d.*; art fees, 653*l.* 6*s.*; art fees due, 4*l.* 18*s.*; science fees, 72*l.* 5*s.*; music (Committee's share of fees), 8*l.* 7*s.* 5*d.*; Government grants—for art, 165*l.*; for science—Mr. Fisher's classes, 99*l.* 9*s.* 6*d.*; Mr. Jago's classes, 48*l.*; total, 1,272*l.* 15*s.* 7*d.*—Cr.: Art masters, 614*l.* 14*s.*; ditto science classes, 84*l.* 6*s.* 4*d.*; Mr. Jago, 62*l.* 10*s.*; printing, rent, and sundries, 216*l.* 11*s.* 7*d.*; balance in hand, 294*l.* 13*s.* 8*d.*"

An active and well-known inhabitant of the town tells us that the actual results in the Science Department are even less satisfactory. The committee must look about them.

SWEDISH CASEMENT WINDOWS.

The use of hinged casements instead of hung sashes is almost universal in Sweden, Norway, and Denmark, and the accompanying illustration shows their usual construction for medium and better class houses. In houses of inferior class, the transom and upper casements are generally omitted. The sash-bar is now generally omitted in better class windows of modern construction. The curvature of head varies from flat to semicircular.

The brickwork round the frames is flush the whole thickness of wall, so that the frames do not rest in a rebate. The jambs are splayed on inside of the frames. The frames are wedged in position and spiked to plugs. The external reveal of brickwork is always narrow, generally 1 in. to 1½ in., and scarcely ever exceeds 2½ in. There are no stone cills or projecting brick cills, the usual finish being a broad strip of stout sheet-iron, chased into or tacked to the cill of the frame and bent down over the brickwork. The drips or flashings to the head and transom are of the same material.

The rebates of the frame to receive the casements rarely exceed $\frac{7}{16}$ in. The sashes are held tightly against the frames when closed, by the hooked fasteners. The finger-hook is sometimes turned round to join the shank near the eye, forming a ring, which is an improvement, as it prevents the hook being drawn out of shape by pulling. These fastenings are perfectly thief-proof, it being impossible to open them from the outside, except by breaking or taking out a pane. The casements are usually held open by the stays shown. But in windy weather, or when the casements are required to be only slightly open, it is usual to secure them by a loose stay-bar of stout wire, having an eye to fit on the pin of the sash-fastener on the muntin, and a hook to go into the eye of the staple on the casement. Jamb and soffit linings are not used except in wooden houses, but the window-seat has a lining flush with the top of the sill of the frame, and finished on the inside with a bead or moulding to conceal its joint with the wall.

The casements, being light and handy, can be easily unhung and lifted into the room, when repairs to the glass are required or for other purposes.

The weathertightness of these windows is remarkable. Draught or leakage between the frame and brickwork is practically unknown, and the casements shut so closely in the frames that, despite the shallowness of the rebates, it is quite exceptional for the heaviest rain to drive in, even when a strong wind is blowing against the window.

The rebates shown on the inside of the frame are intended to receive the inner or double windows, used in winter to exclude the cold. These are of 1 in. or 1½ in. stuff, divided vertically into two halves, meeting on the muntin, and secured either by brads or by special lugs and screws not shown in the illustration. One or more casements are made to open for purposes of ventilation. The value of double windows as a protection against cold is, or ought to be, too well known to require notice.

The cost in Gothenburg, of windows such as shown in the illustration, with frame, sashes, linings, inner or double windows, and fastenings complete, but exclusive of erection, painting, and glazing, is about 25*s.* sterling; windows, 4 ft. 6 in. by 3 ft., complete as above, but with two casements instead of four, about 15*s.* 6*d.*

Alex. Beazeley, M. Inst. C.E.

Halmstad, Sweden.

LONDON STREET ARCHITECTURE.

NEW PREMISES, No. 8, BUCKLERSBURY.

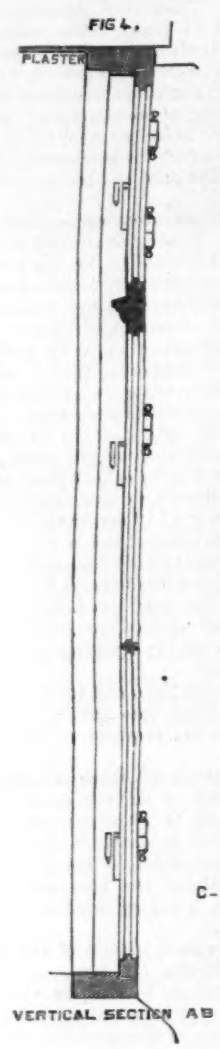
These premises occupy a good position, having frontages to Bucklersbury, Pancras-lane, and the circular corner being in Queen Victoria-street. The building is specially adapted either for a bank or insurance company, and has basement, ground floor, second and third floor stories, and attic, and is about 51 ft. 6 in. high from the pavement to the top of parapet. The ground upon which the building stands comprises only 684 superficial feet, thereby rendering close attention necessary in laying out the plan, so as to obtain the greatest amount of floor space for offices, without in any way impinging upon the staircase, which has been carefully designed to occupy as little room as possible. The basement floor is well lighted, and arranged for offices, on account of the great value of the land.

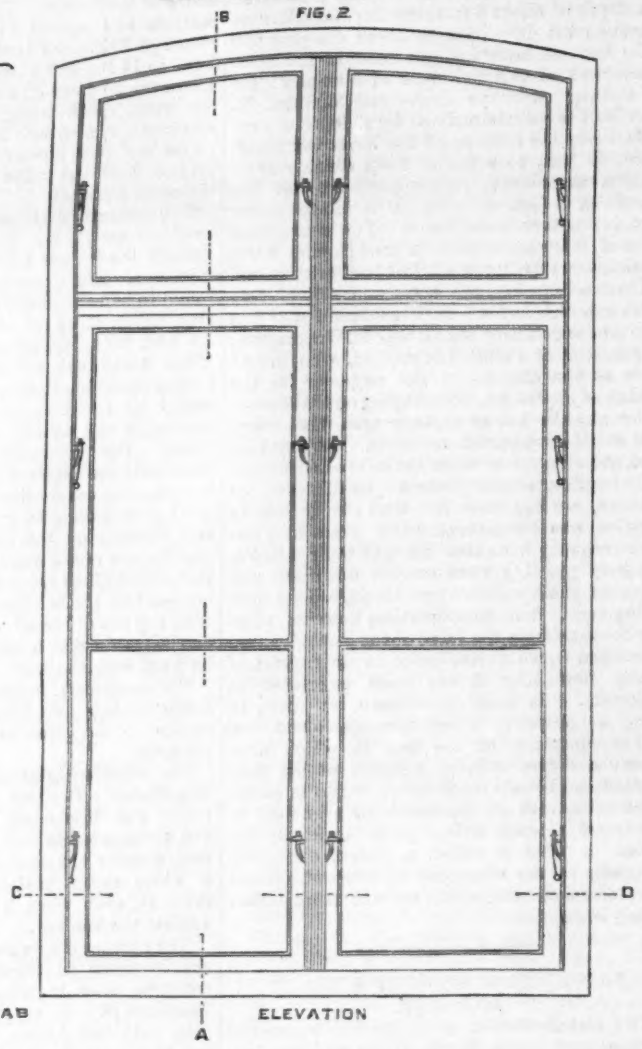
The exterior is of stone. The principal doorway at the corner has two Shap granite columns. The smaller columns above have red Mansfield shafts, with foliated caps.

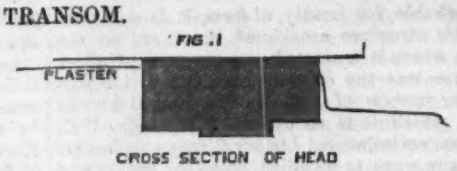
The building has been carried out under the superintendence of Mr. E. Woodthorpe, architect, and the work was executed by Messrs. Perry, Brothers.

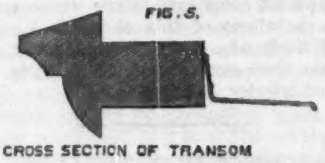
Fresh Air.—Mr. Madox Brown, the painter, suggests that when particularly pure air is required, a balloon should be used bearing a tube aloft through which the air of a higher elevation should be pumped down.

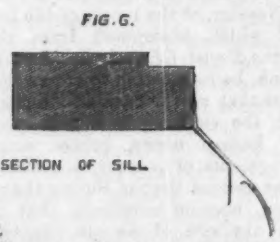
SWEDISH CASEMENT-WINDOW, WITH TRANSOM.

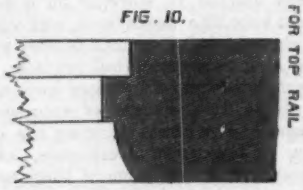


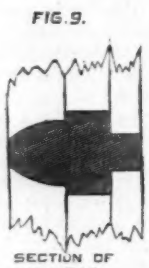


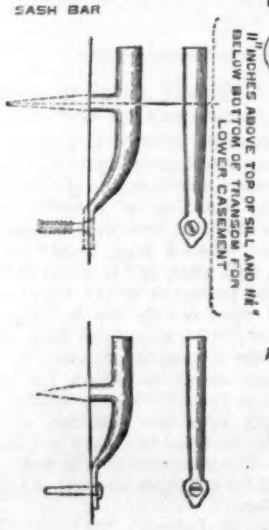


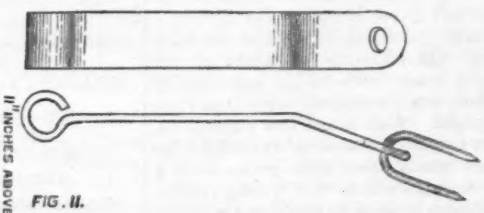


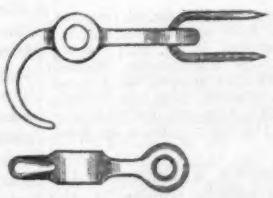


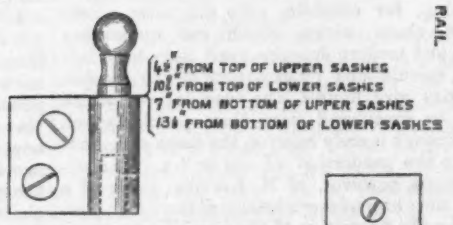


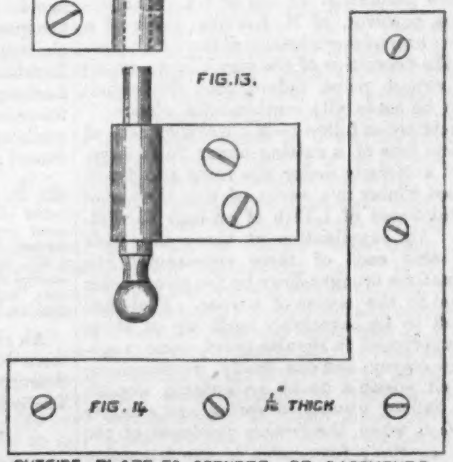


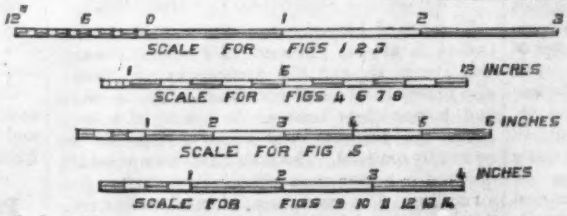








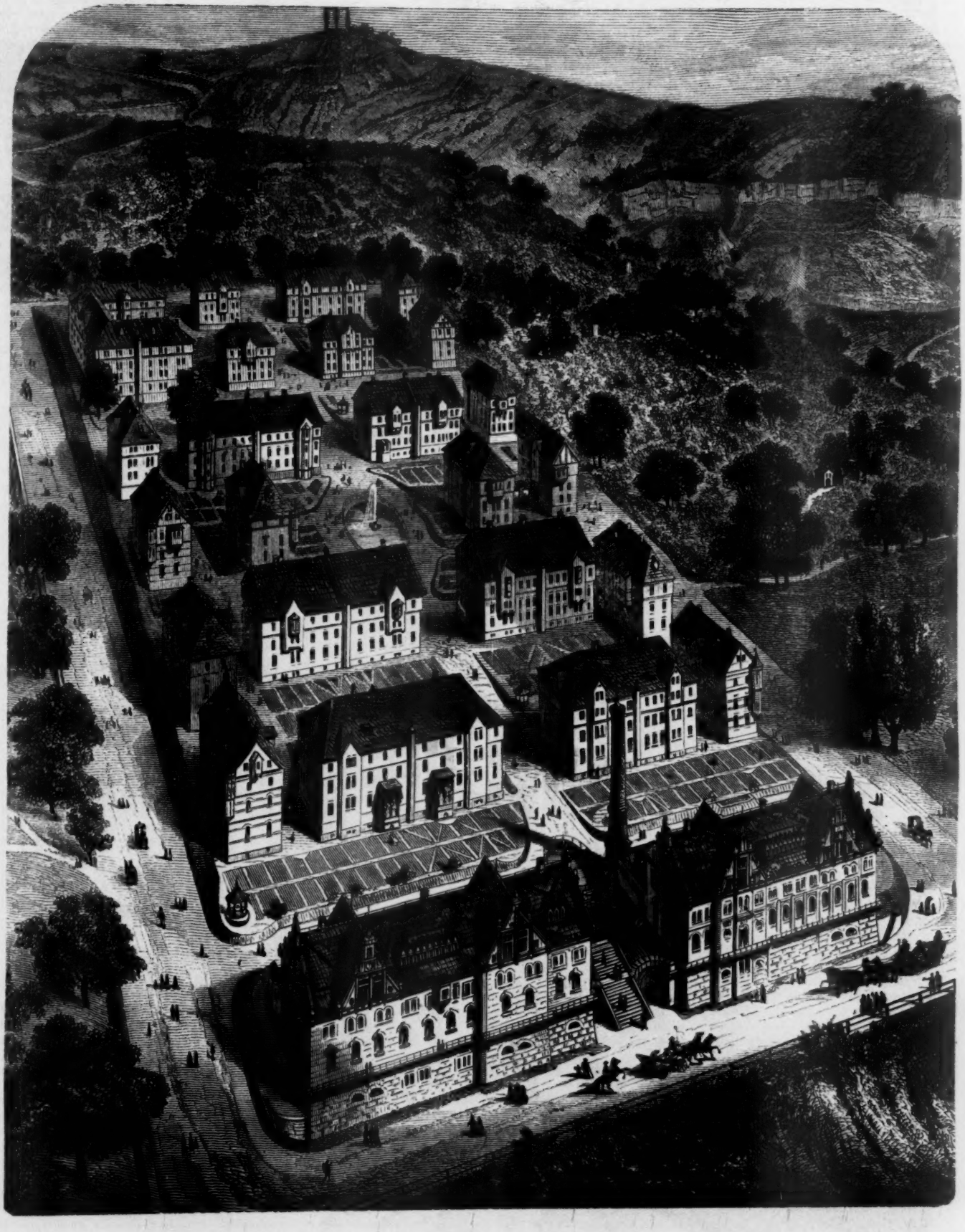



12" 6 0 1 2 3 FEET
SCALE FOR FIGS 1 2 3
1 6 12 INCHES
SCALE FOR FIGS 4 6 7 8
1 2 3 4 5 6 INCHES
SCALE FOR FIG 5
1 2 3 4 INCHES
SCALE FOR FIGS 9 10 11 12 13 14

Rails through-tenoned into stiles, and pegged through with two pegs. Sash-bar stump-tenoned into stiles, and pegged through with one peg. Inner part of muntin (from sash-rebate inwards), cut off to fit inside head and sill. Outer part head of muntin notched into head. Foot of muntin apparently stump-tenoned into sill; Outer part of transom notched into frame and muntin.

LONDON STREET ARCHITECTURE: PREMISES, No. 8, BUCKLERSBURY.

Mr. Edmund Woodthorpe, Architect.



DWELLINGS FOR GOVERNMENT WORKPEOPLE AT STUTTGART.

OBERBAURATH VON MORLOK, ARCHITECT.

WORKING-CLASS DWELLINGS ABROAD.

HOUSES FOR GOVERNMENT WORKPEOPLE AT STUTTGART.

What has been done in England towards the provision of improved homes for the wage-classes of the community is tolerably well known to our readers, but the result of endeavours abroad with the same end in view is not so well known, and a few details will doubtlessly be read with interest.

As regards France, the movement presents a special aspect. There, working-men's dwellings have been mostly erected by large manufacturers, who have formed among themselves societies for the purpose of supplying the wants of their workpeople, in the first place, for house accommodation, but also for working men not employed in their establishments.

One of the largest associations of this nature is the so-called Société d'Immobiliers de Beaucourt (dept. Haut-Rhin). It is a joint-stock company, under the management of Messrs. Jappy Brothers & Co., of Beaucourt, and was established for the purpose of erecting dwellings to be let or sold to the workmen of Messrs. Jappy & Co., or to inhabitants of Beaucourt. The buildings of this society, constructed on the principle of single dwellings, are detached, and stand each in a small piece of garden-land. The separation of the several families is here most completely carried out, for each household inhabits a house by itself. This arrangement contributes much towards fostering family life and encouraging thrift and order, as it engenders in the working-man individually a sense of independence and self-confidence. The houses contain, on the ground-floor, three rooms and a kitchen; in the upper story, two bedrooms and a closet; and below the kitchen, a small cellar. They offer, consequently, enough space even for larger families. Part of the accommodation serves as a workroom to workmen of the firm, as they carry on their trade (watchmaking and fine locksmith's work) at home. But the agreeable feeling of a separate, commodious, and cheap dwelling, with a pretty garden to it, is still further enhanced by the possibility held out to the tenant of becoming, sooner or later, the proprietor of the whole. As in the case of our ordinary building societies, by paying regular instalments, each individual may in time acquire a house of his own,—only in the case under consideration the workmen may choose the intervals at which payment is to be made; the whole must, however, be paid within eleven years, the price being 2,300 francs (92*l.*) per house. The shares of the company being as low as 100 francs (4*l.*) each, the workmen may also become shareholders. The great interest taken by the men in the company and the continual demand for new houses at Beaucourt show that the undertaking of Messrs. Jappy supplied a real want among the people employed by them. More than a hundred houses have been built at Beaucourt, Badevel, and Lafeschotte, and nearly all have been sold; so that further new ones are only erected if a buyer comes forward.

As in Beaucourt, so in Creuzot, the well-known manufacturing town of the Department of the Saône-et-Loire, a company has been formed for the erection of working-men's dwellings, at the head of which are Messrs. Schneider & Co., the eminent firm of ironfounders and engineers. The houses of the company contain either one or four dwellings. Those of one dwelling correspond in their essentials with the houses of Beaucourt, a small stable for cattle and fowls being added. The houses for four families include four dwellings of the same size, completely separated from each other, two in the lower and two in the upper story, to the latter of which lead staircases outside the gable-fronts of the houses. The dwellings, each consisting of two rooms and the necessary offices, are much appreciated by the workmen.

It is, however, in Mühlhausen, Alsace, that the erection of working-men's dwellings has been carried out on the largest scale on the Continent. Here we do not find simply isolated instances of such houses, but whole quarters; indeed, a whole working-men's town has risen up outside Mühlhausen proper. This town numbered already in 1867 about 800 houses; it has squares and broad streets, its own gasworks, its own sewers, waterworks, &c. Buildings of various descriptions are most picturesquely grouped together, some one story, some two stories high, some with cellars and some without, with attics and without. The older houses contain ten, eighteen, and even twenty dwellings, in a row, under one roof; but those built later consist of only four dwellings, grouped round a centre. Each of the dwellings extends through the whole height of the building, and has generally a living-room and kitchen on the ground-floor, bedrooms on the first floor, attic, closet, and a spacious cellar. A small garden is attached to each dwelling.

All the buildings have been erected by a joint-stock company, started by Herr Dollfus, the largest manufacturer at Mühlhausen, in 1852. This "Society for Workmen's Colonies," as it calls itself, lets or sells the separate dwellings at a low price to the workmen employed in the many factories of Mühlhausen and neighbourhood. Only the small sum of 200 to 300 francs (8*l.* to 12*l.*) is required at the first purchase; the remainder is paid off in the shape of a somewhat raised rent. In from fifteen to seventeen years the tenant is able to call his house his own. In this manner, most of the houses have been sold, and a great many are already paid for.

But the colony at Mühlhausen offers to the workmen not only healthy and comfortable dwellings; great attention has also been bestowed upon the advancement of the physical and intellectual welfare of the inhabitants of the colony. The society has erected an hotel, a bakery, and a general provision-shop. The workmen are able to obtain there at low rates a well-prepared meal, nutritious bread, and all other articles required for daily use. There are further two public baths and wash-houses, where a refreshing bath may be had cheap, and where the women may wash and dry the family linen. Care is taken of the young children of the workmen in an infants' school, where from 250 to 300 children of the ages of from three to six years are admitted. The older children are instructed in two elementary schools, erected by the town of Mühlhausen, in the immediate neighbourhood of the colony. Old and invalid workmen are assisted with pecuniary aid by the society; or they find a home in the asylum expressly provided by the society, in case they do not gain admittance anywhere else. Further, there is a free public library. These benefits have not been bestowed in vain. They have borne good fruit. It may give to the founders and members of the society satisfaction to know that their institutions and principles have found numerous imitations in other cities and countries.

Other societies in Elsass, at Gebweiler and at Kolmar, for example, have built workmen's dwellings on the model of those erected at Mühlhausen. Those erections continue to grow in extent, Gebweiler numbering as many as 150, and Kolmar as many as 100 of them.

A society for the erection of working-men's dwellings at Verviers, in Belgium, has, after repeated failures, finally adopted the Mühlhausen buildings. It is especially the detached house with four dwellings which proves itself most suitable, and which, consequently, finds most favour also in Verviers. While, however, at Mühlhausen the four dwellings are distributed round a centre, in the Belgian workmen's houses they lie in a row. The dwellings are spacious, suitable therefore for large families, and are completely separated from each other, so that they may be sold separately. They contain on the ground-floor a forecourt, a living-room, and kitchen; and three bed-rooms above; also an attic, a cellar, and a closet outside the house. A piece of garden 65 ft. long belongs to each dwelling. The houses are well finished both inside and out.

The works for the welfare of the working classes hitherto mentioned all owe their origin to the efforts of large building societies or the co-operation of extensive manufacturers and employers; but the following examples will show how also individual persons have been able, of course at the expense of time and money, to contribute by themselves something towards the improvement of the condition of the working classes, and to effect great good in this direction.

We may mention, in the first place, the laudable exertions of Napoleon III. for the erection of cheap and healthy dwellings for workmen. The most practical illustration of his philanthropic efforts are the houses built by him at Vincennes, and before now mentioned in our pages. Those houses, forty-two in number, are three stories high, two being covered by one common roof. The increase in the price of the soil round the French capital had to be compensated for by the addition of another story, and under those conditions a perfect separation of families was no longer obtainable; consequently the families use the staircase and yard in common, but each household inhabits its own story. The separate dwellings consist of two rooms, kitchen, cellar, attic, and closet, water being laid on. The walls of these houses are of concrete, and they were erected in the short space of four months.

Of greater importance than these houses near Paris are the buildings which Herr J. von Liebig, one of the largest proprietors of factories in Austria, has had erected, in the interest of his workmen, at Reichenberg (Bohemia) and its neighbourhood. At his own expense and risk he has built, near his numerous factories, a great number of dwelling-houses for them. On account of the want of space, expensive building material, and high taxes, the greater part of those buildings are arranged for the accommodation of eight families. Only where the conditions of the place permitted it, for instance at Schwarzwald, in Hungary, Herr von Liebig has had detached houses, for single families, erected. The houses with eight family dwellings have two stories, of four rooms each house and story, so that each dwelling consists of only one room; but to each room are added a small cellar, an attic, a safe in the lobby for keeping provisions, a closet in an outhouse, and behind the house, in a shed, a place for storing coals and wood. This is the sole example of family dwellings of only one room; but the surrounding circumstances necessitated such an arrangement, and it seems to meet the requirements of the poor and frugal people of those districts. Of course, the father of a numerous family has the option of renting a second room. The separate dwellings are not sold here to the workpeople, but only rented, the proprietor undertaking all repairs.

In connexion with these dwellings, Herr von Liebig has originated establishments and provided accommodation which tend to form ties of the most effective nature between the employer and his workmen, and to give their relations to each other somewhat of a patriarchal nature. In the first place, the care of the workmen for the maintenance of their families is lightened as much as possible. For this purpose, the necessaries of life are purchased for them in large quantities, and consequently more cheaply, and sold to them at the cost of purchase; kitchens and bakeries have been established, supplying the workpeople, at cheap rates, with wholesome food and nourishing bread. The most important of these cookeries is that of the Reichenberg factory, where daily 2,000 simple meals with coffee may be furnished; the bakery supplying 100,000 lb. of bread per month.

As care is taken for these requirements of the healthy, so are the wants of the sick looked after. Medical treatment and medicine are given gratuitously, the sick workman at the same time receiving half his wages. In case of death, the greater portion of the funeral expenses is borne by the firm.

The children are not forgotten. Near the workmen's dwellings a building has been erected for receiving 150 children from three to six years of age, to board them and to instruct them, while the parents are at work. The house contains a large play-ground, and several class-rooms, provided with all requirements for teaching, and also with a natural history collection. The house also furnishes accommodation for the steward and the teachers, one of which latter is the daughter of Herr von Liebig. For those of his factories which are too far distant from existing schools, he has had new ones erected on purpose, providing space for eighty children, and has furnished them with all school necessaries. In those places where there are already convenient schools, Sunday schools have been established.

Another similar creation, having for its object the welfare of the workman and his material as well as intellectual advancement, we find at Kuchen, near Geislingen, in the kingdom of Würtemberg, where Herr A. Staub, the proprietor of the extensive spinning and weaving mills there, has erected dwelling-houses and similar institutions, especially characterised by careful execution. As regards the dwellings, there are four or five of them united in one house, either grouped round a centre or built side by side under one common roof. The buildings are two-storied; the ground story containing living-room and kitchen, the bedrooms, to which a staircase leads from the kitchen, being upstairs. Nearly all the houses are the property of the mill-owner; only a few of them have been sold to workmen. The buildings were designed by the architect Morlok of Stuttgart, partly after plans supplied by Herr Staub himself.

There are also baths and wash-houses, a restaurant, and a bakery. Herr Staub has also provided an infant school and an elementary school, as well as a reading-room with a library for adults. There are also a free hospital and dispensary; and besides all these institutions there is a fire brigade, a musical and harmonic society, a savings-bank, and a sick-fund.

In the preceding we have given details respecting several important institutions for the proper housing of workmen and their families and for promoting their welfare generally. In some cases these desirable objects have been attained by associations or societies, in others by individual philanthropists. To these examples we may now add one instance, which is at present unique, of the State taking upon itself to provide proper house accommodation for its officials and *employés*. This instance is furnished by the government of Würtemberg, which a few years ago gained honourable distinction by erecting a number of dwellings for the workmen and officials employed in its ironworks and workshops at Aalen and Wasseralfingen. Quite recently it has constructed a whole quarter for the lower grades of its officials employed in the post-office and railways at Stuttgart. Our illustration represents that picturesque quarter.

The buildings in the two first-named places are arranged for twelve, nine, six, or only two families. A complete separation of the different dwellings in one house is carried out only in the case of the smaller houses with but two family residences. In the other houses, the different families use a common staircase, but each residence is parted off by a door from the landings.

The houses in Aalen and Wasseralfingen, as those of Stuttgart, were erected after the plans and under the special direction of Oberbaurath von Morlok, architect. The principle of keeping the different dwellings separate has been observed as much as possible also in Stuttgart. However, in order to save expense, six family dwellings were united under one roof, and all the houses are three stories high. In order to further utilise the disposable space, in most instances two buildings with six dwellings each, and in one instance a pair with five, have been brought under one roof. In this manner, houses with twelve dwellings have been erected; but a staircase in no instance serves for more than six families. The dwellings themselves are lofty, properly divided for domestic purposes, and well ventilated. Each contains a large living-room, one or two bed-rooms, a shut-off lobby, kitchen, closet, cellar, place for keeping wood and coals, and a room in the attic. (The official dwellings in Aalen and Wasseralfingen are similarly arranged.) To most of the residences galleries and balconies are added, much to the comfort of the inhabitants. The spaces between the buildings are laid out in gardens, and each family is apportioned a part to its own use. The dwellings can only be rented by subaltern officials of the public offices mentioned. The rents are very moderate; for the high rents at Stuttgart were the cause which, in connexion with the steady increase in the price of the necessaries of life, induced the government to build those official dwellings. By their erection two hundred families have been accommodated. But in order to enable its denizens to obtain every-day requirements at moderate charges, the government has erected a large kitchen, baths, and wash-houses. The public kitchen is able to supply daily a thousand portions of well-prepared food. The baths and wash-houses contain the requirements which are now generally found in all similar public establishments. On the whole, those institutions, and the dwellings provided for its *employés* by the government, not to mention the charming and healthy situation of the whole quarter, are a great boon to those occupying them.

DURHAM.

Durham is one of the comparatively few towns which combine a past that is historic with a present which is busy and wealth-creative, for it has had the singular gift of extracting fame and wealth from all its possessions and surroundings. Dating back to the tenth century, and finding its first reason for being in the anxiety of monks to find some place of rest for the bones of St. Cuthbert, the town arose from the influx of visitors to the "lordly seat" of that dead wanderer. Alike from its association with the church, from its naturally-beautiful situation, from the mineral treasures that lie beneath, and from its being the centre and the titular town of a large and prolific county, Durham has largely derived importance. Successive bishops of the see which takes its title from Durham, have left memories enduring of their prelacies in the additions they have made to the cathedral, commenced nearly eight centuries ago by William de Carilepho, sixth bishop of Durham, and which in proportions "huge and vast" looks "down upon the Wear," as in Scott's days, except for the restorations that have long been going on. The massive grandeur of the proportions of the cathedral, the beauty of its towers, chapels, altars, and shrines, have long been noted as perhaps "the most perfect example of the splendour" of the Anglo-Norman architecture: but space forbids, and intention prevents, dilation on these. As the head of the see, Durham boasts of a fitting number of churches: St. Nicholas, St. Oswald, St. Margaret, St. Cuthbert, St. Giles, St. Mary-le-Bow, and St. Mary-the-Less. In addition, Dissent sustains some seven places of worship in Durham, so that the faith of the town should be proved and public. In addition, there are ornate specimens of architecture in the Assize Courts, in the Town and Masonic Halls, in the Miners' Association Hall and Offices, and in other similar buildings. From the universities, colleges, and associations, gathering in or connected with these erections, Durham derives one part of her fame, and one large portion of her revenue. But whilst to her ecclesiastical and scholastic institutions Durham may perhaps date her rise and early growth, and whilst to those of another class—connected with her position as county and assize town—there may be something of her later growth due, yet her importance of recent years is due to the growth of vast industries in and around her. This may, perhaps, be best shown by a comparison of the city as it was about forty years ago, and as it is at present, though, as the growth has been to a large extent outside the bounds, there is only a type of the whole in the municipality. In 1831, the town (which had, ten years previously, 10,282 inhabitants) had only 10,520 inhabitants, so that its ratio was very small. They included many professional men: attorneys, clergymen, and others; the tradesmen were tolerably numerous; there were manufactories for carpets, and establishments, on a small scale, for wool-combing and worsted spinning, but, except for minor trades, these were the only notable industries.

The coal trade at that time was, comparatively speaking, in its infancy, and, except near Brancepeth, there was no adequate development of the immense resources of long-hidden fuel near Durham. Since that time, the railway system has opened out a market for these hidden resources, and the development in the county of Durham was considerable in the first score of years, but it has been far more than equalled by the extraordinary growth that has been known since the uprising of the iron trade of Cleveland, and the consequential demands on the collieries of Durham. The result has been the sinking of pits to an extent undreamt of, and now Durham may be said to be belted loosely round with a girdle of coal-mines and of coke-ovens; and each of these has been the parent of colliery villages, or has caused the growth of the ancient hamlets into embryo towns. The population of the city itself has not advanced as might have been looked for, it being at the last census between 14,000 and 15,000, but this is because the growth of population has been out of urban bounds, and it may be seen in fuller detail in the returns of the union. By 1861, the population in that comparatively small union was 42,462; it had increased to 51,468 in 1871, and there has been a large increase since. Its pauperism has been for years steadily declining, on account of the prosperity of its great industry, and, at the beginning of this year, it had of indoor and out-door paupers 1,117, or 1 to 46 of the population. In the city itself, the deaths in a quarter number nearly 100, and the births are, in the same period, about 140. In the wider bounds of the surrounding rural sanitary authority, the births are in a quarter between 600 and 700, and the deaths are nearly half of the first number. As containing the place of imprisonment for the county, Durham encloses in its prison during the year over 1,300 persons for periods of not more than seven days, and over 4,000 for periods of above that length. And generally it may be said, that whilst the county has acquired the unenviable reputation of being the most criminal county in England, the city has of late contributed largely, over 1,300 persons being proceeded against in a year. It may be here said that the municipal borough stands on 880 acres, and that it includes between 2,000 and 3,000 houses, the population of which has been previously stated.

Certainly the great contributory cause of late years to the growth and prosperity of the city has been its central situation in what is probably the richest of our coal-fields, and at present undoubtedly the most productive of our English coal-yielding counties. A score or two of years ago the coal deposits were chiefly extracted from the north, north-east, and south-western portions of the county, but now the central part is a large contributor, and the district round about Durham is not one of the least. In twenty-six years the coal produce of the county has been doubled; and in the same period the coal and coke carried by the great monopolist railway—the North-Eastern—has been quadrupled; to both of which vast growths the Durham district has been a large contributor. The villages near, such as Tudhoe, Brancepeth, Esk, and others, noted if at all for their importance in the past, have become colliery towns, the valleys near, such as that of the Flass, the Dearness, and others, have become populated and productive, and have tended to swell that great increase of the inhabitants of the county they form a part of—from about a quarter of a million forty years ago to probably three-quarters of a million now. In the Durham part of the county this growth has not shown itself by the formation of vast towns, as it has on the south and on the coast, but it has been shown by the creation of new villages and the extension of old ones, until it might almost be said that that central portion is now a congeries of collieries. And, whilst this growth, this development has its satisfactory side, it has also its unsatisfactory one, for there has been no corresponding growth or extension of the provision for the sanitary needs of the increasing population. And thus the condition of villages like Cothoe, and towns like Spennymoor, is deplorable, although of late something has been done to remedy this, and to sweep away some of the most prominent of the evils, as well as to make a commencement with that work of drainage provision which is the beginning of the cleansing out of that Augean stable. By the private enterprise of the Weardale and Shildon Water Company, also, something is being done to provide the great colliery district with one of the necessaries of life; but much yet remains to be done before the district can become what it should be, and before the abnormal death-rate has been reduced to proportions more in accordance with the conditions under which in their favourable natural position such communities should live. It is not wholly to the coal-mines, however, that Durham owes its commercial importance, for it has large carpet and other manufactories, noted alike for their extent, production, and for the mode in which they have influenced their branches of manufacture in the north.

Looking down on Durham from near the magnificent viaduct which, on the Team Valley branch of the North-Eastern Railway, connects it with the great south line, the gazer will find it difficult to find a more picturesque scene in any district which is at once a centre of ecclesiasticism, of mining, and of manufactures. Down on the winding Wear frowns the cathedral, and near to the "Gothic shade," a mass of streets struggle up hill-sides, uneven and irregular, whilst from the mingled red of tiles, and grey and blue of slates, the spires of churches start upwards, the gaol grimly protrudes itself, the long low roofs of the carpet factories are seen near the river side, and, dispersed over the scene, is the green hue of poplars and other trees, which congregate in masses by the river side and on the steep banks below the cathedral. On the bank of the river, on the hills beyond the town, and far down in the southern distance, there are the tall chimneys and mine-mouth machinery which tell of the omnipresent industry whose minions pour into Durham's crooked and narrow streets and fill her public-houses, and glut her trains on the Saturday after the pay. Behind us is a newer part of the town, and the small but beautiful park which forms one of the lions of the town; to the north, the streets stretch, and to the south they struggle up the hill to where Neville's Cross is the remembrancer—now decaying—of a memorable battle. Thus prodigally-gifted by Nature, and thus favoured of late by the result of commercial enterprise, the future of Durham seems secure. It was distinguished of old in an alliterative phrase for its "wood and water, for its maids and mustard," but it may be now doubtful

whether it is not now more remarkable for its being the gathering-place alike of priests, pitmen, and publicans, as well as of judges and justices. Finding all fish that comes to its net, its bounds are extending, its influence is widening, and its relative position to the county of which it is the capital—one which is perhaps showing more than most the results of commercial skill and enterprise—is, at least, not retrogressive.

THE QUEEN ANNE STYLE.

LIVERPOOL ARCHITECTURAL SOCIETY.

On Wednesday, the 3rd inst., the thirtieth session of this society was opened, and the president, Mr. J. M. Hay, delivered as usual an address. After reviewing a recent excursion to Whalley Abbey, the reader said:—

Coeval with the decline of Gothic art a new order of things began, for with the revival of letters in Italy arose a feeling for the Classic which speedily spread itself over Europe and produced a style of architecture known in Italy as the Cinque-cento, and in France as the Renaissance. Here it produced the peculiar architecture of the time of Elizabeth and James I., a style inheriting much of the spirit and picturesqueness of the ancient Gothic, which was partly eliminated or merged in the pure Classic Italian of the works of Inigo Jones, Sir Christopher Wren, and their immediate successors; a style which, though every style has had its admirers, and been reproduced in modern works, has, gradually modernised and localised, held its own to the present time. Of all these revivals, the most interesting and important is that of the Gothic. Let us look at its history, how it was prepared for by the writings and advocacy of men of eminent literary attainments, how we were familiarised with the aspect of Mediæval buildings by such illustrated works as those of John Britton, how the popular sympathy was awakened, and how encouragement was given to the new style. It is curious also to observe that it was the style lowest down in the historic scale that first found favour in our sight, viz., the Rectilineal, or Perpendicular as it was then called. After more study and research our admiration ascended to the next in order, viz., the Decorated; first, the flowing, and then the geometrical. We rested long there; it was the period when Gothic art had reached the very summit of its perfection, and it was advocated as the best style for our imitation and adoption, and as a point of departure for a new style of our own. However, we cannot wait to develop any new style, we are too restless and impatient. We go back a little further, higher up the scale, into the period when tracery was in embryo. We do not tarry even there, we have actually imitated the transition, from Norman to Lancet. But worse remains behind, for where are we now? Some of us remember well how vigorously some twenty-five years ago the battle of styles was fought,—Classic *versus* Gothic,—and how we thought the preponderance of argument to be in favour of Gothic. But time has brought its revenge, the Classics have it at last, and by desertion from the opposite side too. For is it not by a section of the Gothic party that the reign of Queen Anne has been introduced? How long will it last? She reigned twelve years. Her revived dominion I suspect will have ceased ere a similar time has elapsed. But, to speak seriously, surely there is nothing in the architecture of Queen Anne's reign but what might be readily and harmoniously infused into and assimilated with the Classic architecture of the nineteenth century. In the name of common sense what are we to have next? To be consistent we should go on and revive the style of the Georges, or the ghosts of their Majesties may be jealous. But we have arrears of history to bring up. After the Elizabethan and Jacobean should have come the Carlovingian, and then the William and Mary style. Why cannot we have the Bloody Mary style? That would be an elegant sensational name for a style that would strongly recommend it to the present generation. Let us take what is characteristic of the architecture of Queen Anne's reign and throw it into the great secular style of the present century, which is broad and plastic enough to absorb it, and to which, indeed, it properly belongs, to be employed or rejected according to the taste of the practitioner or the needs of his subject.

What is this style, do you ask? It is the style I have just mentioned,—the English branch of the great Italian group of styles; the style in which Wren built St. Paul's Cathedral, and which in the hands of Vanbrugh, Gibbs, Hawksmoor, the Earl of Burlington, Chambers, Dance, the four Adams, Wyatt, Holland, Sir Robert Taylor, Soane, and others, was carried down to the present century. Throw these Queen Anne elements into this style, for they are properly accidental phenomena of it, of this same style as it existed in the reign of Anne, in the early part of the eighteenth century, and was practised by Wren, Vanbrugh, and some others I have just named, in palatial and ecclesiastical edifices. The style has grown since then, and we have no more to do with the particular phase of it that characterised the domestic architecture of the reign of Anne than our living poets have to do with the style of Cato or the "Essay on Man"; and it would be quite as sensible for Mr. Tennyson to hamper his muse to reproduce the heroic couplets of Pope as for an architect of our day to copy the door-cases and windows of Queen Anne. As a style, or phase of a style, what there can be in it to attract us from our present broad and grand one, I cannot imagine. There was something to recommend the pure Greek revival, there was something to recommend the Gothic. There was something in the fourteenth century Italian painting to entice the "Pre-Raffaelite Brethren,"—religious feeling, namely, and other estimable qualities which Raffaelle and the great Roman and Florentine schools had not transmitted to our times. But what is there in the architecture of Queen Anne that is worth our travelling over more than a century and a half of time and history to fetch? Echo answers, What is there?

It is time to have done with this unceasing revival of defunct styles. Everything we do should have something of the latter part of the nineteenth century about it; something that partakes of the genius of to-day, and that yesterday could not have produced. By retaining of the past only what has relation to all time, and is intransitory, and wedding it to what is best of our own can we worthily develop architectural thought, and produce original works. Yet, fully admitting the great and widespread architectural activity of the present day, and notwithstanding our possession of numerous magnificent buildings, the fruits of that activity, there is an undefined feeling abroad that we have no national style. With that feeling I do not altogether sympathise, and I have no doubt that with due appreciation of our glorious heritage in the past, fidelity to the trust reposed in us by the present, and a wise use and application of the varied resources now at our command, we need not despair of producing works capable of exciting the same exalted pleasure as did the noble cathedrals of York, Lincoln, and Salisbury, when first they passed from the workmen's hands. The mention of these buildings reminds me of a remarkable movement that has taken place within the last few months, the establishment, namely, of a Society for the Protection of Ancient Buildings, with reference chiefly, I believe, to our Mediæval cathedrals and churches. The establishment of such a society cannot fail to have an interest of some kind for all persons of taste and culture, for assuredly than such buildings as Durham and Lincoln Cathedrals, York Minster or Westminster Abbey, in their present venerable state, no structures can be more worthy of preservation from every species of injury, from everything calculated to lessen their artistic value or phonetic utterances to us. No structures seem to me so worthy to enshrine the pure and sublime form of Christianity. More interesting are they, more enriched by time, more pregnant to the mind with historic and ecclesiastical associations, than anything carefully preserved in national museums. The British Museum, it is true, contains capitals of columns and sculptures from the Parthenon and other renowned edifices, and alabaster slabs that lined the Assyrian palaces. But these are only fragments of celebrated buildings, while the works to which I am now calling your attention are entire works of art,—organic and breathing wholes. What is more, they are essentially English works, distinct from the Gothic of the Continent. They possess a character of their own, assimilated only to French, German, and Spanish Gothic by the same religious aims, and in having taken a tinge from the romantic ages of chivalry and the Crusades.

In referring to the establishment of the Society for the Protection of Ancient Buildings, the sentiments of which, as expressed in their prospectus, I was glad to see supported in an able leader of *Punch*, a week or two ago, I feel it a pleasure to recognise the fact that, so far as I know, it owes its existence to a great extent to the writings of a member and ex-president of this society, Mr. Samuel Huggins, whose first paper on the subject, as well as one so late as last November, was read to this society.

WATER FOR LONDON.

METROPOLITAN BOARD OF WORKS.

At a meeting of the Board on the 5th inst., Mr. Leslie, in accordance with previous notice, proceeded to propose that the Board should take into consideration the advantage of obtaining a supply of sea water for fire brigade purposes, for baths, and for watering roads and streets. In his opinion, the question affected the whole of the ratepayers of the metropolis. The cost of watering the streets was estimated at from 40*l.* to 60*l.* per mile per annum; and Capt. Shaw estimated that 75,000 hydrants placed at convenient distances in the streets, with full pressure, would be sufficient to extinguish fires without the use of fire-engines. He held that sea water was better than river water for extinguishing fires, and for that reason he proposed that sea water should be used for the purposes mentioned. Sea water could be brought from Colehaven, Sea Reach, and Canvey Island to the Bow Station in the Mile End-road, a distance of twenty-two miles. Assuming the water was taken from Canvey Island, it was only four miles from the highest point in Essex, where it would have to be pumped up to the distance of 738 ft. He thought the cost of bringing sea water to London in the necessary quantity would be about 500,000*l.*, but he claimed for his scheme a saving of 90,000*l.* to the ratepayers of the metropolis.

The motion was seconded by Sir W. Codrington, and on a division there appeared for the motion 3, against it 23.

The Brunel Statue.

Mr. Meaden proposed the adoption of a report of the Parks, Commons, and Open Spaces Committee, recommending that the railings of the garden inclosure next the Brunel Statue, on the Victoria Embankment, be brought forward, so as to surround the base of the pedestal, and protect it from damage.

Mr. Deputy J. E. Saunders said he hoped the Board would hesitate before they consented to what at that moment, it appeared to him, would be a very ridiculous proceeding. The statue itself might be a very good one, and perhaps the base also, but the masonry which had been erected on each side gave it a most extraordinary appearance altogether. As it at present stood, it was about the ugliest and most horrid structure of the kind he had ever seen. If it had one merit, however, it was that seats had been provided for the accommodation of the public, and now it was proposed that railings should be put up so that those seats could not be used. He would move as an amendment that the whole subject should be referred to the Works and General Purposes Committee, with a view of ascertaining if some improvement of the present state of things could not be secured.

Mr. Dresser-Rogers seconded the amendment, which was accepted by Mr. Meaden, and carried.

We have never heard who takes the responsibility of this very ugly affair. As a matter of course it must be re-arranged.

Foundations of Houses.

A report from the Building Act Committee was brought up with reference to the letter from the Local Government Board, transmitting copies of letters from Mr. C. Clinton Hoey, calling attention to the character, foundations, and materials, of certain dwellings for the working classes, being erected at Hackney Wick; that in reply thereto a copy of the letter of Mr. F. R. Meeson, district surveyor for East Hackney (North), be sent to the Local Government Board for transmission to Mr. Hoey. This reply was to the effect that at present the district surveyor had no power to interfere with the buildings as to the materials used in the foundations of houses.

It was explained that a Bill had been prepared which would give the Board power to direct surveyors to see that the foundations of houses were sufficient, and that the materials used in the erection of the buildings were sound and

sufficient. That Bill had not been passed in the last session of Parliament for want of time, but in the next session the Chairman would introduce it. However, up to that time, nothing more could be done than that which was recommended by the Committee.

We understand that a committee reported on Monday in favour of Messrs. Bazalgette, Bramwell, & Easton's proposition, coupled with another for purchasing the whole metropolitan water companies' interest at twenty-five years' purchase on the average dividends of the last three years, with 10 per cent. addition for compulsory purchase. Some who had signed, however, afterwards withdrew, and the report was referred back for further consideration. Inquiries are already being made as to sites for the four reservoirs.

THE SANITARY CONGRESS AT LEAMINGTON.

At the second day's sittings (Oct. 4) of the Leamington Congress of the Sanitary Institute of Great Britain (Dr. Richardson, F.R.S., president, in the chair), Dr. Wilson (medical officer of health for Mid-Warwickshire) read a paper on "The Past and Future of Sanitary Science." Dr. Wilson, at the outset, said sanitary science in the broad sense of the term was knit up with the life history of every nation. He pointed to the importance with which it was viewed by the Jews and the ancient Greeks. Although the Romans, the other powerful nation of antiquity, contributed but little to sanitary science, they had left behind them some wonderful examples of sanitary engineering on a large scale. If we looked to the habits of our forefathers we had no difficulty in accounting for the fearful mortality which prevailed among them. Personal cleanliness was utterly neglected, clothing was immoderately thick and warm, and was seldom changed night or day. Their diet and dwellings were unwholesome; the streets were unpaved, and the rural population was scattered in hovels over wild woods, dreary wastes, and undrained marshes. Cities and large towns were walled in like fortresses, which were highly favourable to overcrowding, and the large armies conduced greatly to the spread of epidemic disease. He alluded to the numerous plagues and pestilences that had devasted Europe as they had devastated the East, and said it was not until the plague, which was the next great pestilence after the sweating sickness, had repeatedly attacked this country, and the great fire which swept away the crowded and filthy houses of London in 1666 occurred, that people began to appreciate, though in a faint and glimmering way, the principles of prevention. Coming to the eighteenth century, they found that three terrible scourges, namely, the black death, the sweating sickness, and the plague, had finally disappeared from the bills of mortality, and their disappearance was mainly attributable to the silent influence of the onward progress of civilisation. Foremost among the pioneers of sanitary science they found the honoured names of Sir George Baker, Captain Cook, John Howard, and the immortal Dr. Jenner. The population of England and Wales, which in round numbers was only ten millions in 1810, had now increased to over twenty-four millions, and that numerous increase had taken place almost exclusively in already populous towns or at centres of industry which speedily became populous. But that great increase of population had taken place under the worst and most unfavourable conditions. Even in the construction of the better-class houses the veriest rudiments of sanitation were neglected. Instead of municipal control, there was general apathy. Meanwhile the Legislature had done nothing, or next to nothing, to mitigate or prevent the terrible evils which were fast accumulating. With the exception of the Factory Act of 1833, and the Poor-law Amendment Act of the following year, no public measure of any importance had been attempted. At last, thanks to the incessant labours of Dr. Farr, Edwin Chadwick, Dr. Southwood Smith, Dr. Guy, and other pioneers of sanitary progress, the Health of Towns Commission was appointed, and their first report appeared in 1844,—a report in which the revelations of cause and effect, as applied to disease, were made so glaring and manifest, that among the intelligent few was a loud cry for legislative interference. So powerful were vested interests, so strong was the opposition to interfere with the liberty of the subject, or of corporate bodies, that it was not till the country was again threatened with the ravages of a cholera epidemic,—it had been visited by one in 1831,—that Parliament became alarmed, and passed the Public Health Act of 1848. Under this Act the General Board of Health was constituted, with a staff of inspectors who were empowered to hold public inquiries, and report on the sanitary condition of towns which showed an excessive rate of mortality. The Act itself was adopted or enforced in a great many towns throughout the country, but as it was of a peculiar nature, like the vast majority of the Sanitary Acts which have followed it, the beneficial results which might have been expected to accrue from it were long in appearing, and were by no means general. Nevertheless, it originated an era of active sanitary improvements in most of our large towns, and it merits special notice as the first outspoken recognition on the part of the Legislature that the health of the State concerns the statesman. In order to maintain a sustained and successful raid against the large classes of disease which had their origin in filth, whether it be polluted water or tainted air, they wanted, in the first place, hospital accommodation within easy distance for the isolation of infectious diseases, they wanted compulsory and early information of such cases, and what was very hard to get, the active and intelligent co-operation of the public in the abatement of those local conditions of filth and nuisance to which he had alluded. So long as medical men were paid solely and simply for attempting to cure, it was obvious that it was not to their interest to prevent it, and he asked whether it would not be a wiser policy to pay the family medical attendant so much a year, and thereby enlist his services in conserving the health of the household. In conclusion, Dr. Wilson said the average death-rate for England and Wales, for years back,—indeed, he might say, from the time when the returns of the Registrar-General began to be published,—had, with slight fluctuations, remained stationary, at a little over 22 per 1,000, and there were some pessimists who argued that because the average death-rate had not been lowered during the long period of forty years, sanitary improvements were powerless to combat against the death-roll entailed by over-crowding and over-population. With regard to the possibility of lowering the general death-rate and prolonging the average duration of life there was no doubt.

Mr. W. White read a paper on the treatment of sewage, based upon experiments made at Stoke Workhouse. He said the sewage of no two towns was identical, nor the sewage of the same town at different times of the day. Hence until the constituents of sewage were determined it was idle to ask or quote a price for its treatment. One of the favourite prescriptions for the treatment of sewage was lime, and the question had often occurred to him what possible efficacy could lime have over alkaline sewage. He had treated Stoke Workhouse sewage with lime in small quantities and large, but towards purification and even clarification it contributed little or nothing. The indiscriminate employment of lime had done much to discredit and retard precipitation. In the case of domestic sewage it was not an alkali but an acid that was wanted, or, better, an acid salt, and after innumerable experiments the favour of chemists tended to concentrate upon sulphate of aluminum. In that recommendation of sulphate of aluminum modern science re-enforced ancient experience. Charcoal or coke reduced to fine dust and saturated with chlor-oxide of calcium was, in conjunction with sulphate of aluminum, perhaps the most powerful combination of material for sewage purification yet devised.

Mr. Baldwin Latham, C.E., F.G.S., gave a paper "On the Influence of the Movement of Subterraneous Water on Health." Mr. Latham sought to show how important was the effect which the various conditions of subterraneous water had upon health. As its height decreased from meteorological causes or drought they found that diarrhœa, dysentery, and enteric diseases generally were multiplied, and concurrent with the increase of the water they diminished. It had been further demonstrated that the prevalence of phthisis depended upon the quality of surface water supply.

Dr. Horace Swete, analyst to the borough of Leamington, county and city of Worcester, &c., read a paper on the new artesian water supply at Leamington. Commencing with a history of the new artesian supply of water, he said the impurity of the filtered river supply and private well supply led to the determination of a few to discover, at any reasonable cost, a supply of deep spring-water. The very fact of Leamington owing its existence as a town to its saline springs added difficulties which seemed to be insurmountable. The first experimental boring was not long in tapping, not water, but salt; fresh borings were, however, made, and success had attended them from the first. A pure water, more copious as the borings went deeper, demonstrated the scientific correctness of the inference that Leamington was on a great water-bearing stratum, and ultimately to achieve the triumphant success of being able to pump up two and a quarter millions of gallons of water in the twenty-four hours. Turning to the old well-water supply, he said little or nothing that was good could be said of it. Of 139 wells analysed by him during the last two years, 104 were so bad that they had been closed by the authorities. It could not be said that Leamington was alone in the possession of filthy wells. Ordinary house wells were invariably bad, and he fully agreed with the advice given by Dr. Hill at Birmingham,—"If you are unfortunately obliged to drink well-water—boil it." The paper next dealt with the chemical properties of the water supply of Leamington, and in conclusion Dr. Swete said that although the present water supply was not satisfactory, the future was that of a good, wholesome, and sparkling water, and copious in quantity. On the completion of the engines which were to pump the water to the reservoir on the Campian Hills, which would not be many months hence, Leamington would have a supply second to none in the kingdom.

A short discussion followed the reading of the paper.

Dr. Bartlett (London) argued that very soft water was not necessarily the best, and he supported his argument by producing an example of its corrosive effect on lead piping.

Dr. Bond questioned whether they were entitled to condemn well-water so indiscriminately. He was convinced that in rural districts it was possible to drink for years well-water contaminated with certain definite sources of contamination. It was only when they got specific germs that there was real danger, and in many cases such contamination was impossible.

The Chairman (Dr. Richardson) said water containing a fair amount of saline matter made no impression upon lead, and he had seen soft water which did not have the effect described by Dr. Bartlett. He admitted, however, that as a rule soft water had a corrosive effect. The only way to arrive at a correct conclusion was to fully investigate each case.

Surgeon-Major De Chaumont, M.D., Professor of Military Hygiene, read a paper on the effects of climate upon health.

Dr. H. C. Bartlett, of London, followed with a paper on "Water for Domestic Use." He pointed out that living organic matter of low organisation was not checked by any excess of water, unless there were extensive matters, either in solution or suspension, which proved chemically inimical to the vitality of those organisms. Unless those organisms, animal or vegetable, died out or were deprived of life by the mineral or other matters brought in contact with them in the water, they could not be resolved into their elements by any simple power of oxidation. Hence it was a very fatal error to believe that mere excessive dilution would rapidly eliminate the specific poisonous matters which found their way into wells, streams, and other sources of water supply. Pure water, strictly speaking, was almost unattainable. That was to say, pure hydrogen combined with oxygen to form hydric oxide, or chemically pure water, was so solvent of almost all matters with which it came in contact that, be they solid or gaseous, some portion was carried away in the water. Water condensed from steam might be obtained, by using very great precaution, of all the needful purity to enable them to observe the characteristics of water free from adventitious influences. It was flat and insipid to the taste, and beyond being recommended for its solvent properties as an agent for the elimination of unwholesome deposits in the body in certain diseases, could only be required for domestic use when all the water otherwise obtainable was found to be altogether unsuitable. Rain-water, the distilled water of nature, was not to be regarded at any time as absolutely pure; and although in great request for its softness, or the absence of the salts of the alkaline earths, was frequently collected by such means as ren-

dered it dangerous to drink, becoming sometimes quite poisonous. No mere chemical analysis would detect the presence of injurious germs in water, any more than they could expect pure chemistry to give them any evidence of specific typhoid poison, whether it existed as germs conveyed direct from patients to the water, or if it were carried by gaseous emanations as *aërozoa*. Neither could they obtain from any microscopical examination of water, without the assistance of chemical analysis, any reliable data which, in themselves, were comprehensive enough to guide them in discriminating between wholesome and unwholesome drinking-water.

The next paper was read by Mr. W. Eassie, C.E., London, on "Growing Vegetation and its Effects upon Human Health."

Miss Rose Adams read a paper, entitled "Woman's Work in Relation to Sanitary Science." She stated, in the first place, that although many people thought that man's province lay outside the house and woman's within, she did not agree with that theory. It was a grave truth that it was essential to its success that women should work on sanitary reform. She pointed out how, in many ways, women could assist in sanitary work better than men. The Ladies' Sanitary Association had, however, much prejudice to overcome. They were endeavouring to teach the women of England all that was necessary in connexion with the due preservation of health, and she laid stress upon the great importance, for instance, of women knowing how to prevent the spread of epidemic disease. She also pointed out many other ways in which women, with a thorough knowledge of sanitary requirements, could confer great benefits not only upon themselves, but upon the community at large.

The last paper read was by Dr. Slade King, the subject being "Sanitary Work in English Watering Places and Summer Resorts." The writer pointed out the absolute disregard of sanitary precautions which existed at hotels and lodging-houses in many seaside towns, and recommended a system of licensing and a stringent supervision by the governing authorities of the places.

In the evening a *conversazione* was held at the public hall, Windsor-street.

On the 5th inst. Dr. R. Brudenell Carter gave a long and able address on the present possibilities of sanitary legislation. Alluding to the importance of and great necessity for sanitary legislation, he said one of the things they must ask the Legislature was to give them adequate assistance in inclosing or curbing those channels, such as soil-pipes or water-courses, through which diseases most familiar to them were daily distributed. It could not be said that in making such a request they should ask the Legislature to interfere in small matters, or undertake duties that were unworthy of an imperial assembly, but one of the first lessons in politics he ever learnt was the maxim of Lord Macaulay, that the business of a Government was to protect the lives and the property of the governed. It could not be denied that the lives and property of the governed were sorely in need of protection from sanitary evils. In an address he gave at London some three or four years ago he took occasion to point out that the seven principal zymotic diseases in the preceding twenty-five years had destroyed in England and Wales the lives of two and a half millions of people out of a total mortality of eleven millions. If they added to that another half million for another five years, they arrived at a total mortality from zymotic diseases of three millions, or nearly equal to the present population of London. He took the average annual mortality of 100,000, and multiplied it by six, in order to obtain a very low estimate of the average annual sickness, and he divided the result into classes —adult males, adult females, and children —according to the census proportions. Dr. Buchanan was good enough to furnish him with an estimate of the average duration of the different forms of disease, calculated, of course, from the first appearance, and Dr. Buchanan had given it as his opinion that four weeks and a half was a reasonable average. He estimated the loss that was caused to each male adult by his illness at 1*l.* a week, and the cost of his maintenance, nursing and medical attendance at the same sum, thus giving a total of 9*l.* an illness. In the case of each female adult he estimated the cost of such an illness at 6*l.*, and of children at 1*l.* Those estimates amounted to a total of more than two millions and a half sterling, representing the cost or loss every year occasioned by the zymotic diseases in England and Wales if they fell upon the wage-earning classes alone. The greater loss caused by their incidence on the upper class could not be estimated from any data that were known to him. The loss caused by these attacks of epidemic disease fell partly upon the relatives and friends, partly upon clubs and burial societies, and partly upon the savings of the sufferers. The 100,000 premature interments that took place annually must cost at least 2*l.* each, and that brought up the total loss to 2,796,402*l.* But the estimate did not take the widows and orphans who were left without the care of their protectors into account, and they must also reckon the loss to the community which resulted from imperfect recoveries. It was his lot in the London hospitals to see large numbers of children who were suffering from diseases of the eye, and the constant reply to his questions was that they had been previously suffering from scarlet fever and measles. It was too much, of course, to say that all zymotic diseases could be prevented by improved legislation and adequate care, but they knew the great reduction that had taken place in the zymotic mortality of England coincident with the improved removal of night-soil. The impediments which stood in the way of a permanent and complete reform were due to four causes (1st), the degree in which legislation had reference to the needs of party instead of the requirements of the State; (2) the degree in which local self-government was impeded by centralisation; (3) the real or apparent inequality of the incidence of local taxation, from which the cost of all sanitary reforms must be defrayed; and (4) the apathy, which was the result of almost inconceivable ignorance, largely engendered by superstition. He need hardly point out that the apathy which was engendered by ignorance and superstition was the cause which permitted the existence of the others. He recommended the registration of every case of infectious disease that fell under the notice, in his official capacity, of any public practitioner. He should like to see far more than that,—he should like every practitioner to report on every case of infectious disease to which he was called. But they must not ask too much at once, and the benefits which would follow from the registration of infectious disease among public patients would soon lead to registration among private patients also. Whenever an outbreak of infectious disease occurred an inspector should be sent down from the central office to discover how the disease was introduced there, and by what channel it came. He wished to say that by an inspector he did not mean a barrister, nor an engineer, nor a surveyor, nor a person who did not know scarlet fever from measles, nor one whose report from mere stress of ignorance would be certain to contain as many blunders as words. He meant a physician thoroughly trained in the difficult art of sanitary inquiry, and thoroughly conversant with every branch of the subject to which his attention would be directed. The report of the inspector, after it had been approved by his chief, would be made public, and would appear in the local newspapers. He thought it would be wise if the Central Health Authority for some time confined its efforts to the one disease of typhoid fever, which would afford employment to a considerable staff, and as it was known to proceed from two very simple causes,—sewer gas in towns, and polluted water in all places. If what he suggested could be carried out, local authorities would not be over-ridden, and the time would come when the sewers would be ventilated and the pollution of water prevented. Politicians should also turn their attention to the question of the incidence of rating, with a view of revising and re-arranging a system which the nation had long since outgrown. Speaking of centralisation, he said its effect was that they could only find inferior persons to hold offices which entailed considerable trouble, and which gave them very little authority. Boards of Guardians had no more control over the funds which they had to administer than if they were so many automata. They could not give an extra shilling a week to a porter, or a half-pint of beer to an inmate, or engage a servant without the sanction of the Local Government Board. The supposed reason for that was that there was a necessity for protecting the ratepayer against the extravagance of his own nominees. Would it not be much better in the long run if he had to protect himself, and so be forced to be careful about the abilities and character of the men for whom his votes were recorded? Under the present system, members of Boards of Guardians were often elected by a party vote, without any reference to their capabilities, and in municipal boroughs it was not uncommon for them to be persons who could not aspire to be town councillors, but whose services to their party were rewarded by a seat on the Board of Guardians to give them a claim to have their speeches reported in the paper. Would it not be better if such bodies were empowered to pass any bye-laws not in contravention to the laws of the kingdom, which their local circumstances might render desirable? Why should not their great towns be prepared to act as pioneers in the great work of sanitary progress? At present they saw Parliament every year unable to accomplish its work, and that was, to a great extent, due to the time occupied by the discussion of questions which might be practically and well settled by local bodies. He felt sure that the gradual emancipation of those bodies was a direction in which their steps must lead. Local self-government would render the election of incapable men impossible, and whatever blunders occurred would furnish warning to be avoided, and a successful administration would furnish an example to be imitated.

At a meeting at the Town-hall, presided over by Mr. E. Chadwick, Mr. Burton Green read a paper on sewage disposal and sanitary carbon. He said "dry" systems were all costly, and depended to a great extent upon the sale of the "manure" they produced; they were, moreover, repugnant to their sentiments of delicacy. It was universally admitted that no chemical process could *per se* efficiently purify sewage, and it was suggested that the effluent water after precipitation, subsidence, or straining, should be passed through filter beds of "sanitary carbon," the *débris* remaining after the destructive distillation of Kimmeridge shale, and which was really an animal charcoal. Its efficacy had been proved by practical experience at Hurstpierpoint, at Daventry, and at the Marquis of Exeter's mansion; and it might advantageously be employed for many of the purposes for which animal charcoal, costing four or five times as much, was used, the price of this "sanitary carbon" being about 4*l.* per ton. The exhausted filter beds mixed with the sludge form a portable, cheap, and rich manure, the application of which to the land had been proved by the experience of centuries to be absolutely fatal to the existence of grub and wire-worm. It was also applicable to various other purposes, among them, as an absorbent in the "dry" systems, and in earth closets, in hospitals and sick-rooms, as well as a deodorant of slaughter-house and other refuse.

Mr. Lawson Tait, F.R.C.S., gave an account of the work of the Interception Sub-committee in connexion with the Birmingham Corporation, his address being illustrated by working models and plans. Mr. Tait explained at some length the working of the pan system, and what is known as Fryer's process of sewage treatment. He said they were only at present treating one-sixth of the population with the experimental process, and if it turned out as well as they had hopes of its doing, the results would be most valuable. The expense of horse-hire, which was the most costly item, would be greatly diminished by the establishment of wharfs.

Papers were afterwards read by Dr. Stevenson (Paddington), "On Public Conveyances for the Infected Sick," suggesting a uniform system for the country at large; and Dr. James Russell (Edinburgh), "On the necessity of Plumbers and Builders possessing a competent Knowledge of the Laws of Health as bearing on their Respective Occupations."

At a meeting of the second section in the Pump-rooms, Dr. Richardson presiding,

Mr. J. S. Baly, F.L.S., medical officer of health for Leamington, gave an address on the sanitary condition of Leamington. He said the average death-rate from all causes during the past four years was 16·8. The birth-rate, 25·8, was low, owing to the absence of manufactories and to the comparatively small number of artisans living in the district. The mortality during the last quarter was very much below the average, and gave a death-rate of 10·7; and the fact of no death from diarrhœa having occurred during the summer quarter of 1877 was very remarkable. He ventured to predict that Leamington, with its new water-supply, its sanitary arrangements, and low death-rate, would retain as it had hitherto its place in the first rank of inland watering-places.

Mr. W. Eassie, C.E., read a paper on cremation as a sanitary institution.

Mr. H. C. Burdett, late of Birmingham, read a paper, entitled "The Dwellings of the Poor in Large Towns." The paper set forth Mr. Burdett's experience among the dwellings of the poorer classes in London and Dublin. He drew a picture of fearful misery and squalor. In Dublin, he said, he found the houses for the most part in a dirty and dilapidated condition, with bad water-supply and imperfect drainage. In London, as a rule, the houses were comparatively clean; but the rents being often enormous, the over-crowding in some places was appalling. He advised all who had money to spare to take shares in the Victoria, Artisans', or Industrial Dwellings Companies, and other similar associations, without delay, as the directors needed more capital to enable them to extend their crusade against such vile dens as he had seen.

Papers were afterwards read by Mr. Ernest Turner, London, on "Home, Sweet Home;" Mr. T. J. Dyke, F.R.C.S., on "The Missing Links in the Sanitary Administrative Service;" and the Rev. E. Wyatt Edgell, B.A., on "The Diminution of Insanity which took place during the Political Commotion in France."

This concluded the sectional business, and the proceedings terminated with votes of thanks to the mayor and corporation of Leamington for having so cordially entertained the Congress.

In the evening the members dined together at the Regent Hotel.

Saturday last was devoted to excursions, one party going to Coventry to see the sewage works there. Of these works we give a special account below.

SEWAGE PURIFICATION AT COVENTRY.

In connexion with the Sanitary Congress held last week at Leamington, the chairman and directors of the Rivers Purification Association (Limited) on Saturday last invited the members of the Sanitary Institute of Great Britain, and the Corporations of Leamington and Coventry, to visit their works at Coventry. The Association, of which the Right Hon. Lord Elibank is chairman, has been formed for the purpose of carrying out the requirements of the Rivers Pollution Prevention Act, by which undefecated sewage is prohibited from being discharged into streams and rivers. The Association offers to assist Town Councils, Local Boards, and Sanitary Authorities, to purify the water-carried sewage and manufacturing refuse of their districts, either by the execution of new works, or the adaptation of existing works for the purpose. The Association does not confine its operations to any particular system, but will adopt either chemical treatment, irrigation, or a combination of both, according to the special circumstances of each case. It recognises the advantages of irrigation where sufficient land can be obtained under favourable conditions, but expresses the opinion that as such conditions are only met with in practice in exceptional instances, most cases will involve chemical treatment either *per se*, or in combination with a comparatively small area of land. In May of the present year the Association entered into a contract with the Corporation of Coventry to purify the sewage of the city by their precipitation process, undertaking to indemnify the corporation against legal proceedings for the discharge of their sewage into the river Sherbourne. The good results attending their operations are evidenced by the fact that the principal landowner on the river-banks (the high sheriff of Warwickshire), who had previously been at variance with the corporation on account of the pollution of the river, has recently expressed his satisfaction with its condition. The Sherbourne is a very small stream, and frequently during dry weather contains little other water than the effluent from the sewage works. It is, therefore, necessary to purify the sewage to a much higher standard than is practically required for discharge into large rivers. The process adopted by the Association has been in operation for more than three years* (previously to May last under the auspices of another company, and for a time under the management of the Corporation), and the Corporation have certified that they are well satisfied with its sanitary success, and have entered into a contract with the Association, by which the latter body undertakes to continue the purification of the sewage in consideration of being subsidised by the Corporation. The amount of the subsidy is, it is stated, 2,000*l.* per annum; besides this, the Corporation gives the sewage, the use of the buildings in which the work is carried on, and the use of the land (about nine acres in extent) over which the effluent is passed before entering the river. Thus, the Association does not base its operations on the assumption that the sewage is a highly valuable, and therefore marketable commodity,—an assumption which has led to the failure of other undertakings of the kind. It proceeds on the basis that sewage is a nuisance to be got rid of in the best way possible without creating other nuisances. It claims to have solved the problem, and offers to indemnify against legal proceedings under the Rivers Pollution Prevention Act any corporate body or health authority with whom it may contract for the rendering of town sewage innocuous. It asserts that for the performance of this work the ratepayers must expect to pay, and indeed, will be glad to pay, if the nuisance is effectually got rid of.

So far as to the general principles upon which the operations of the Association are based. As to the particular instance of Coventry, the details were explained to the visitors on Saturday by Messrs. Henry Robinson and J. C. Melliss, the engineers to the Association, and by Mr. E. F. Coddington, the manager of the works. The city of Coventry has a population of 40,000. It has a water-supply of about 25 gallons per day, and 5,000 water-closets. The daily volume of sewage in dry weather amounts, inclusive of subsoil water leaking into the sewers, to 2,000,000 gallons in twenty-four hours, or 50 gallons per head per diem. The character of the sewage is extremely foul, owing to the presence of large quantities of refuse liquids from the numerous silk-dyeing works, breweries, oil and varnish works, &c. The sewage is, therefore, more costly and difficult to purify than ordinary domestic sewage. The sewage flows by gravitation to the works at Whitley, about a mile from the city, and all solid matters are strained by the ingenious extractor invented by Mr. Baldwin Latham, and of which the Association has acquired the patent-right. This extractor may be described as a wheel 16 ft. in diameter, having a periphery projecting on one side of the edge to a distance of about 1 ft. or 1 ft. 6 in. The wheel is actuated by steam-power, and is vertically mounted. From the centre radiate six spokes or arms, of the same width as the periphery, and made of iron perforated with numerous holes. Each of these spokes or arms forms in reality a shelf or tray, having its outer or front edge turned up so as to prevent solid matters falling off. The whole of the space of what may be called the back of the wheel is covered with a large disc of perforated iron of the same diameter as the wheel. The wheel is continually revolving (there are a pair, in case of accident to one), with its lower portion submerged in the sewage as received from the town. Each of the arms or spokes as it emerges from the sewage brings up a quantity of solid matter, and this, as the wheel continues to rotate, falls by its own gravity into a fixed receptacle placed for it at the centre of the wheel. From this receptacle it is carried up by an archimedean screw into boxes or skips provided for it, which are removed as often as necessary. The solid matter obtained in this way is not very considerable in amount, and all that has hitherto been obtained Mr. Coddington has dug into some garden-ground within the precincts of the works. The strained sewage is then mixed with a solution of sulphate of alumina, prepared in a cheap way by treating the shale of the coal and ironstone formations with sulphuric acid. The necessary engine-power, boilers, mixers, and other apparatus, are provided, both for the admixture of the chemicals with the sewage, and also for the manufacture of some of the chemicals themselves. The sewage next receives a small quantity of milk of lime, and then flows to one of the precipitating tanks, of which there are four, worked on the continuous principle. The period allowed for subsidence is from four to five days. The effluent water passes from the settanks through about nine acres of land, forming filter-beds, 5 ft. deep, planted with rye-grass. This land is divided into two nearly equal portions, one of which is used by day, and the other by night. The effluent water passes into the Sherbourne at the rate of about 80,000 gallons per hour, and apparently in a satisfactory condition as to purity, and certainly much better than the water of the river above the outfall. It is stated that fish have been seen at the outfall, and that cows will drink of the effluent water in preference to the water of the river itself. The sludge produced at the Coventry sewage works has been assigned, by Dr. Voelcker, a higher value than any other sludge, as he states, in the Local Government Board Blue Book that it (containing 47 per cent. of moisture) is theoretically worth 16s. 9½d. per ton, and has a market value of from 5s. 6d. to 8s. 4d. per ton. It does not, however, fetch this alleged value at present, and the Association does not rely on it as affording any immediate return for the cost of purifying the sewage. During the present year about 2,000 tons of partially dried sludge (equivalent to a year's production) have been sold, at from 1s. 6d. to 2s. 6d. per load, according to the number of loads taken. The cost for chemicals at Coventry is stated by the Association to be four-tenths of a penny per thousand gallons of manufacturing sewage, or twenty-seven-hundredths of a penny per thousand gallons of domestic sewage. (This latter has been ascertained at Fair-time during Whitsuntide week, and on Sundays, when the manufacturing refuse is absent from the sewage).

The visitors, among them many sanitary engineers and borough surveyors, seemed to be favourably impressed with the works and their apparently successful operation, and the opinion was expressed that if the Association had really solved the problem of how to get rid of town sewage without creating a nuisance, it might be sure of a prosperous and enlarged sphere of usefulness. It was stated that several corporations or local authorities were in treaty with the Association for the disposal of their sewage. It was also stated that, though the Coventry works constitute at present the only establishment under the control of the Association, and that they are, therefore, necessarily to some extent a "show-place," no exceptional means are taken to make the works successful in a sanitary sense, other than those demanded by the peculiar foulness of the sewage, and the extreme smallness of the stream into which the effluent is discharged. We may add that the effluent, as it passes into the river after filtration through the nine acres of land referred to, contains (according to analysis by Dr. Voelcker) only 0·6 of albuminoid ammonia in one million parts.

* Some particulars of the works as formerly carried on, with plans and view, were given in the *Builder* for Feb. 28th, 1876 (vol. xxxiv., pp. 191, 192).

THE SOUTHPORT NEW COVERED MARKET.

COMPETITION DESIGNS.

To the many public buildings which have been erected in Southport within the last few years another is about to be added. In July last the corporation decided to invite architects to send in designs and plans for a new market building, and premiums of 100*l.*, 50*l.*, and 25*l.* were offered for the best, second best, and third best, respectively. The conditions of the competition provided that the cost of the building should not exceed 15,000*l.*, the committee laying down certain requisites which they thought necessary. In other respects, as to style of architecture and mode of internal arrangement, the competitors were left free to follow their own ideas. In answer to the advertisement inviting competition twenty-five sets of designs have been sent in, which are stated to represent a very large amount of architectural ability and experience. The plans have been arranged for inspection in the large room of the Town-hall, and also in the council chamber, one room not being large enough to contain the whole. The designs differ from each other considerably as to the treatment of the building so far as the external architectural features are concerned, but resemble each other closely in the arrangement of the interior. Some of the plans cover the whole of the land with one large market, whilst others divide the hall into two, three, or four divisions, in order to accommodate the several departments of trade. The whole of the plans, with one exception, it is said, provide for a basement floor for cellars and store-rooms, and a ground floor for the market proper, whilst many of the plans show a first floor over a portion of the building for use as offices. In all the designs the materials recommended are brick, with stone dressings. The several designs are at present under the consideration of a committee of selection, and we understand that the list of twenty-five has already been reduced to six, out of which the best three have yet to be chosen.

HOVE SCHOOL BOARD COMPETITION.

Thirteen designs were received by the Hove School Board, Brighton, in open competition for their first school, to be erected in Ellen-street, Cliftonville, and, after consideration, that submitted under the motto "MENS" was accepted, the authors being Mr. Thomas Simpson, of Brighton, and Mr. Frederick W. Roper, of Adam-street, Adelphi, joint architects. The schools will accommodate 800 children, viz., 150 boys, 250 girls, and 400 infants, and are designed two stories in height; the lower being apportioned to the infants, in two compartments, and the upper floor to the boys and girls. A kitchen is provided in connexion with the girls' school, for instruction in cookery. The building has a façade towards Ellen-street of 160 ft., and the style is a simple treatment of "Queen Anne," with gables and a central turret of two stages. The materials will be red brick, with tile roofs and the turret of wood, leaded.

SCIENCE AND ART IN ITALY.

On Thursday evening, the 27th ult., Professor Leone Levi delivered a lecture on "Science and Art in Italy" at the Surrey Association for the Advancement of Literature, Science, and Art, at Camberwell New-road. After reviewing at some length what Italy had done in science and art, the lecturer said: And what of the present? Alas! let it be admitted, Italy has greatly fallen from her glorious past; centuries of political and commercial decadence have had a grievous influence on Italian art and science. It is not to Italy that we can now look for the highest manifestation of human genius. The prodigies of chemistry and mechanics, the wonders of the steam-engine, and many of those inventions which reflect the greatest lustre on the present century, and which has rendered it so conspicuous for progress and civilisation, received but little assistance from Italy, and though labourers have not been wanting who have pursued the paths of science in the midst of the greatest discouragements and difficulties, and who have striven hard to maintain the noble name of Italian science on a pinnacle of glory and reputation, they have not been able to keep pace with the greater advance of France, England, and other more favoured countries. And yet science and art have not altogether departed from Italy. There, too, men of science have their Congresses in the same manner as the British Association in this country. There, too, the learned societies meet for the promotion of special branches of science, and there academies exist for art, science, and letters. The art contributions of Italy to the Universal Exhibitions in London, Paris, and Vienna, especially in sculpture, were in many respects highly satisfactory. In inventions, Italy is not far behind other countries, a large number of patents being yearly claimed and granted, though not certainly to be compared, either in number or in actual merit, with the United Kingdom and the United States. But, after all, we must consider this as only a time of transition. The most encouraging and promising feature of the present constitutional government of Italy is the thoroughness with which the present state of the country, economically and intellectually, has been investigated and exposed. What we have before us is only the result of labour performed during centuries of divisions and misgovernment, at a time when the arms of the Church and State were alike directed against all manner of progress, and when the highest minds were either driven away from the country or immured in State prisons or convent cells; and though it is so far true that genius and talent are intuitive within us, and that they are often developed under most adverse influences, yet, as a rule, roses do not well thrive in a soil rugged and wild. Prepare the ground; offer to science and art a safe asylum and a kindly hospitality. Let wealth reward them, and honour encourage them. Let peace have her victories and war her desolations, and art and science will once more show their wonders in the far-famed soil of Italy. May this the sowing-time of Italy's future greatness be followed by the glorious sunshine of happy influences from within and without, and in due time may an abounding harvest be gathered in the Italian soil from scientific inquiry and artistic inspiration. If Italy should ascend once more to the high position she once attained in science and art, religion and morals may also rise to an equal height. Let her remember that science and art must be consecrated to God ere it can render any essential service to a nation. A Galileo and a Newton may scan the heavens, but we need a Chalmers to direct the mind across that expanse to the Great Architect. Painting and sculpture may enliven and embellish our existence; but have they not been made to foster human passions, instead of subserving to the higher objects of quickening and expanding our conceptions of God's mighty works? And poetry, the great vehicle by which we may burst forth in sentiments of adoration, is it not too often prostituted so as to raise the warrior and the freebooter to the height of a hero? Let us remember that whilst the mind is the great engine, the heart is the motive power of human progress, and science does but little for a nation when it stops at the threshold of our mental faculties. However enthusiastic we may be in the cultivation of science, and however proud of its achievements, we should not forget the great maxim that it is "Righteousness that exalteth a nation."

THE SEVERN BRIDGE RAILWAY.

The progress of the Severn Bridge Railway is week by week becoming more apparent. Of the work of constructing the bridge, assigned to the Hamilton's Windsor Iron Company, at a contract price of 190,000*l.*, some interesting particulars are given in the *Gloucester Mercury*. Two-thirds of the width of the river have already been spanned. The approach to the bridge on the Forest shore is made by a viaduct, while the abutments are being constructed of native stone. There will be twelve arches, carried to an altitude of 70 ft. Immediately connected with this is the first span of the bridge, 134 ft., the piers of which are being founded. There are four of these in a cluster, each cylinder having to be taken 16 ft. into the solid rock. For this purpose an engine and air-pressure apparatus are employed. The cylinders are fitted in lifts of 4 ft. in depth, and great as is the weight of a series of these, each being at least four tons, some eighty tons of ballast are required upon each column to counteract the pressure of the air to displace the water from the interior. After the first span comes two of 327 ft.; a fourth of 171 ft., and the remainder (13) 134 ft. each. For the heavier spans there will be a cluster of cylinders as indicated, each 10 ft. in diameter, and are to be founded 44 ft. below low-water mark. Seventeen of the piers have been founded in the bed of the Severn, and dangerous and difficult as the work appears, under the direction of Mr. Earle, the resident manager, and the Hamilton's Windsor Iron Company, together with the engineers, so far it has been carried out without accident to the persons employed. In addition to the seventeen piers named, it may be added that the whole of the 134 ft. spans are erected, and the scaffolding nearly prepared for the first of the 171 ft. spans, the foundations being completed and the piers finished for three of these. The spans are raised in pieces from the vessels by a "Goliath," which powerful machinery is constructed so as to run with double carriage outside the bridge, on a line of rails, and they are lifted some 80 ft. above low-water mark. Two-thirds of the bridge are so far complete as to be ready for laying the permanent way. An interesting feature is the provision made for expansion and contraction. One end is secured upon a plate of cast-iron bolted to a large block of Forest stone, the other end being connected with a system of rollers, space being left at the extremities of the girders to meet the action of atmospheric influences. The columns are filled with concrete, three parts slag from the Parkend furnaces, and the other part Aberthaw lime, prepared at the contractors' kilns, on the banks of the Severn, at Lydney. Some idea of this item of cost alone may be gathered when it is mentioned a single column of the larger piers consumes 800 tons of concrete. From the centre of the bridge extensive and charming views of forest and river are commanded. Down Channel this extends to the Bristol river, and the up-view embraces a sweeping range of the Valley of Gloucester, with Robin's Wood-hill and Stroud Vale forming a picturesque background. On the opposite banks of the Severn is the old canal running from Sharpness, and this will be crossed with a swing bridge, to be worked from a centre tower of Forest stone masonry. The engineers who designed the structure, and who are now carrying out the work, are Mr. G. W. Keeling, jun., C.E., of Lydney, and Mr. George Wells Owen, C.E., Westminster; and Mr. Reichenbach is the resident engineer. The railway works, which are being executed by Messrs. Vickers & Cooke, of London, whose contract was 90,000*l.*, are progressing.

PEERAGE PROPERTY.

Sir,—Messrs. H. & R. Powell, than whom, I am sure, no gentlemen have a better right to speak upon the land question, desire further information from my point of view upon "peerage property." Nothing delights me more than to satisfy the minds of inquirers after the truth, and I will now mention the names of some peers who hold properties gigantic enough to be a nuisance and a danger to the country. Your correspondents not being satisfied about the five men that I said owned a quarter of Scotland, I will give them their names, and if they can prove me wrong, I shall be glad to know wherein my error lies. They are the Dukes of Athole, Argyll, Buccleugh, Sutherland, and the Earl of Breadalbane, the latter peer being able to ride 100 miles in a straight line on his own land, it is said, without coming across a single dwelling; but I do not vouch for that, though I suspect it is much too near the truth. That another quarter is owned by twenty-four men is not unlikely, and it is quite possible that 130 millions of acres are owned by 130,000 persons. A country which contains such towns as Edinburgh, Glasgow, Paisley, Stirling, Leith, Greenock, Dundee, Aberdeen, &c., could not be without great numbers of small proprietors of houses, gardens, yards, and other business premises, besides church and school property, freehold graves in churchyards, cemeteries, &c. But this does not alter the very much too patent fact that the great food-producing areas of England, Scotland, Ireland, and Wales are in comparatively few hands. Messrs. Powell object to my statistics of 60,000 men being the landowners of the United Kingdom, but I think I might have named 6,000 or 60, or even 6, who have the lion's share; but I have very little doubt that the Blue Book is quite enough on the Powell side of the question in naming 60,000 as the only landowners. I have some freehold property myself, but I am not a landowner for all that. I suppose the gentlemen would count me as one of the owners of land, because I am the proprietor of "six feet of earth" in Brompton Cemetery. Then they say "Mr. Mitchell seems to think nearly all the country belongs to peers," and they inform me that "out of all this mass of landowners (that is the 60,000, as they seem after all to admit), only some 500 can be peers."

Now I never said that peers owned most of the country, but I hold up "peerage property" as samples of the worst kind. There are lots of baronets and squires who are nearly as big land monopolists as the peers, but the peers are the worst offenders. I heartily wish that the peers had it all, for then there would be a chance of some wholesome legislation in the House of Commons, whereas more than half the present House have gone there to batten up the corrupt land system which is starving and ruining the country. Messrs. H. & R. Powell say that there is no difficulty about purchasing land in this country. Very well, gentlemen, I say; will you obtain for me a piece of freehold property in my native village from the squire and I will buy it to pay me only 2 per cent.! Why, there was an old gentleman who died in his own freehold house in that village a few months ago, and I heard that his freehold house and garden were to be put up to auction. I made up my mind to purchase it, but I find that the squire's agent was there long before any auction could take place, and the property was bought for him. Owning nearly everything in the village, I suppose he thought he would have it quite all. Landowners in England find their appetite for land

"*Grow on what it feeds on.*"

They are like the sailor who, when the captain asked what would be his three greatest wishes, replied,—

"1. All the rum in the world.
2. All the baccy in the world."

Then he paused, but when pressed by the master for his third wish, he said, "Well, Cap'n, let's have a little more rum!" That is why I suppose the Duke of Northumberland, as a very good authority states, invests 80,000*l.* per annum in adding adjoining estates to his already enormous property.

The Messrs. Powell say that a sweeping fallacy underlies the whole of my letter. Well, these gentlemen only assert this, they do not condescend to prove it; but I think I can show the following statement of theirs to be fallacious enough, viz., that "a small portion of a nobleman's estate is laid out as a park." Now, I happened last week to have passed by two miles of the wall of Woburn Park, and I understand the whole length of the Duke of Bedford's park wall is fourteen miles! I have calculated that thirty thousand human beings could live in plenty out of this park, if cultivated by the people! Now, I would not deprive the Duke of a bit of park round about his mansion, not I; but I would like to see an Act of Parliament limiting the extent of parks, woods, and pleasure-grounds to a moderate area, especially as these immense properties are virtually untaxed, and yield nothing to the revenue; I say *nothing* advisedly, for if the taxes paid by the nobility and gentry are put against the pensions and salaries paid to their class for doing nothing, or worse, I find that it is just three millions of money in their favour and against the people's, so that in reality all the taxation they pay goes to a club for keeping their poor relations, to which those whom they despise and will not associate nor intermarry with, yearly add 3,000,000*l.*! And Messrs. H. & R. Powell say also, that "every single farm supports a farmer, a number of labourers with wives and children, and gives work to butchers," &c. I should like to ask these gentlemen if they know what an amount of political bribery there is going on in the letting of these large farms. No man can get a big farm who is not prepared to be the political agent of the landlord. Mr. John Bright told me in the inner lobby of the House of Commons that the land of this country was used by its owners as a gigantic tool of bribery and corruption, and I have found it to be perfectly true. It is these large farmers who are the curse of the country. They get their land for less than its value in order to do the landowner's corrupt and dirty work. Small farmers are honest men, who would be Radicals if allowed to be, and would make their landlords pay their taxes, but the big farmer overawes them, and makes slaves of them.

Now, let us take any estate under the Messrs. Powell's system, and see what it produces. Well, it grows a few ricks of nice hay, a few mows of good wheat and barley, some decent rooks, and a magnificent crop of game, weeds, and vermin. It supports my Lord, or Sir John, or Squire, as the case may be, in a great temple, fit receptacle for the local god. It supports a score or two of servants, it supports a scanty population of needy people, dwelling in thatched mud fever-dens, save and except a few farmers who are the political followers of their landowner, and are, in fact, a part of his property, body and soul, placed there to feed his game, to echo his opinions, and to starve the people on his estate. As to butchers, surely the gentlemen are not in earnest in believing that farm-labourers deal with butchers! Why, they do not taste meat much more than once a year, many of them. Nine-tenths of the rural population in England seldom taste meat. Butchers, excepting those in the towns, ten miles apart mostly, are scarcely to be found,—their services are not required. The butchers only call once a week, and many of them find it does not pay to go so often, and make it once a fortnight. English people residing on the great areas of land right away from the towns do not eat meat. No, they are wisely kept on a regimen of prayer and fasting in order to cow them well down, or they would never submit to the slavery and degradation in which they have to exist.

But supposing that the land question had developed into practice, that the land had been nationalised, that my Lord, or Sir John, or Squire, had been quietly pensioned and confined within moderate limits, and all their game driven into a sort of zoological garden for the swells' amusement, what would be the result for the people around? Why, the farmer class would increase tenfold. The labourers would have good pay, and a four-acre plot attached to their dwellings. They would retire as little farmers by and by, and a new race of stalwart labourers would grow up, to whom good wages could be paid. The population would increase enormously. Instead of our villages decaying and gradually going down and down as they now do, they would grow up into townships, with gas, and town-halls, and public baths, and all the appliances of civilised life. Trade would flourish wonderfully, independent of any Eldorados abroad. Butchers and other tradesmen would drive a roaring trade. The people would require, and could then afford to pay for, decent food, clothing, and furniture. As they would also demand a different sort of house to live in than they possess at present, there would be enough building required to employ all the builders for some generations to come; in fact, the nationalisation of the land is all that is required to bring back prosperity to the country. I must offer Messrs. Powell the advice to study the whole land question, read Blue Books, as I do, and every author from John Stuart Mill downwards who has written upon this subject, and they will find the fallacies that underlie the apologies for the present system, unless it suits personal interests to become apologists. I dare say it would suit my private interests to row in with the "big-wigs," but I will not have the pillow of my death-bed stuffed with thorns if I know it. I will speak the truth, and shame the—dukes. Your correspondents doubt the fact that any nobleman has an income of 1,600,000*l.* per annum. Now it is notorious that a paragraph went the round of the papers uncontradicted that the Westminster property had increased fourfold in value in a quarter of a century. If four times four are not sixteen, will the gentlemen tell me what it is? As to 500,000*l.* a-year, that is the income of more than one peer of the realm; but anyhow, they have more of the space allotted to the children of men than is necessary or proper, and they will have to give some of it up one day, or, as I said before, a revolution is inevitable.

With regard to America, I may state that I often receive American papers, and that I constantly read jeremiads on the grinding capitalists and land-sharks of the Transatlantic Republic. That there are scoundrels in America who would bring about the same abominable land monopoly as this country groans under, there can be no doubt, and it is not unlikely that some very stringent land laws will be shortly passed. One thing is in favour of the Yankees,—they have not any laws of primogeniture and entail, and the Stewart, Astor, and other properties will soon fall to pieces by a natural process, as our "peerage property" would do in this country but for our absurd land laws. Another advantage the American has over us is that he can have an acre or a hundred acres of land transferred to him as easily as if he were buying a horse or a piano, while in this country it is such a fuss and expense to buy land that people are afraid to invest when they might otherwise do so; and this reminds me that your correspondents ask, "What peer would refuse to turn his estate to better account?" Why, I venture to say that if Messrs. H. & R. Powell were to make proposals to any agents of the nobility to purchase or take on lease any one estate for the purpose of dividing it into small farms, they would find if they did not actually get a curt refusal, that there were such innumerable obstacles in the way of getting a slice of any of these parchment-hampered desert-warrens that the thing would fall to the ground. I cut from the *Bridport News* the following advertisement:—"This is to give notice, that any person or persons found trespassing or nutting in Powerstock Common, or any of the woods belonging to the Right Hon. Earl of Sandwich, will be prosecuted as the law directs.—By order, John Howe."

You see, Sir, the Earl of Sandwich declares in this advertisement that he has defied all law, honour, citizen rights, and national custom in order to absorb Powerstock Common. If he succeeds in keeping a cowed and starving people from asserting their rights for a few years longer, Powerstock Common will be certainly peerage property; but how is the Earl of Sandwich to sell or lease that which is not his own? The fact is, and I must take the risk of loosing my good character for moderation with Messrs. H. & R. Powell when I say it, that most of the peers have *no title* to their property good enough to transfer, and that is why they cannot and will not hear of leases, and that is why the Parliaments of the United Kingdom, the one wholly, and the other mostly composed of landowners, cannot, dare not, and will not pass a compulsory Tenant Right Bill. Your correspondents have mentioned Mr. Mechi as an authority on the land question. I will accept him as such, and I will tell them just one or two things which that able man has said in support of my theory. In September, 1857, Alderman Mechi declared in a speech delivered in London, that his own men made of their allotments forty times as much as the large farmers, and that there are 22,000,000 acres of poor permanent pasture yielding next to nothing, which might be turned into rich garden allotments for the working classes; and I say that I can confirm Mr. Mechi's words, for I went into an allotment ground in Somerset not long ago, and I found that men with one-eighth of an acre were growing stuff worth 20*l.* This shows 160*l.* per acre. Lord Derby in a speech at Liverpool said the land could yield double the food it does, and I say in the hands of the people it would yield tenfold, twentyfold, ay, fortyfold what it does now.

As to your correspondent, "W. H. W.," I think he is not far from the political kingdom of heaven, but he must not be afraid of "setting class against class." The robbed ought to be set against the robbers. I can assure him that my figures are right enough about the rating of mansions, and I hope he will thoroughly investigate this matter.

George Mitchell, "One from the Plough."

PERCEPTION OF COLOUR.

Reading Mr. Wallace's paper in *Macmillan*, I paused for reflection, and, looking round the room, where many diversities of colour were open to view, I found that the eye rested instinctively upon and recognised the greens; I then said that I would pick out the reds, which required a distinct mental effort: bright scarlet coming first. I now know that this choice came naturally, because of the obvious contrast.

I then tried the browns, and found them too closely associated with and graduating into the reds to be satisfactorily distinguished. Here I became sensible of a want, and looked around for blue, but bright blue was conspicuous by its absence, and such as I saw appeared hazy; the darker shades inclining, as Mr. Gladstone suggests, to black, the lighter shades fading into white.

The whites glared in the bright sunshine: they dazed my sight like glass roofing; the blacks shone as though they had a white surface, and only became recognised as blacks by means of their background, which threw them into relief. Clearly, if all other colours were removed, the room would show light and darkness only, but there would be glittering discs wherever the rays impinged.

The yellows and golds were the last to be distinguished, having at first involuntarily classed them with the browns; the walnuts, mahoganies, and rosewoods serve as a neutral tint, showing the wisdom of such choice for our domestic furniture, and its adaptability in nature.

My sight recognises each shade of known colours, and the order quoted above is due to preference or natural selection only. The perception of colour affords a very useful means of distinguishing different objects and its advantages are manifold; there is primarily, the sensuous gratification of the optical faculty, elevated by some favoured individuals into an intellectual power of supernal effect; we derive from it also definition of outline, order, use, gradation in workmanship, increased grace of construction, and, above all, the association of ideas, embracing all the powers of memory, affection, life. The eye drinks in light, and all that follows is an appurtenance or adjunct of the sense of sight in man, dependent, however, on what is called "the education of the eye."

Obviously, those undulations of light which produce in us the perception of colour have an effect which we find gratifying, this apparently concerns the sensorium; we do not at present know whether this pleasurable sensation results from the momentum of these undulations, or from the eyes' own power of reproducing exact pictures by reflection; but of these sensations the green effects are found most soothing, the blues most stimulating, reds most violent, yellow the most equable, white the most natural, being merely the sensation of light, while black is true quiescence or darkness itself. The perception of colour is therefore as much a distinct sensation as is the handling of a chair. A. H.

CLEOPATRA'S NEEDLE.

The expected arrival of this ancient relic excites so much public interest as to the site of its allocation, that a few remarks may not at the moment be inopportune.

It must be apparent to every one that, first of all, the position chosen should be upon a more than ordinarily public thoroughfare, and open to view; besides that, it should not conflict with any other public monument, nor be overshadowed by any lofty edifice.

As to the allocation of the model, close to the Houses of Parliament, St. Margaret's Church, and Abbey, surrounded by artistically sculptured modern memorials, and some ancient statuary, it would convert the pretty gardens into a dreamy "Campo Santo," where the character of the treasure would be perverted, if not wholly effaced. Leaving out of question other sites already put forward, that in the Green Park, on the highest elevation close to Piccadilly (nearly opposite the Club), is ostensibly the best; but another position, much more appropriate, as being close to the South Kensington Museum, and near to the splendid new buildings, now nearly completed, is here suggested: it is the interval between the Old Museum and Thurloe-square, where the Cromwell-road is at the junction over 160 ft. wide, and where the open planted grounds of the Museum on one side, and of Thurloe-square on the other, would lend dignity to the object in view. If it were decided to adopt this position, the obelisk might be placed either in the mid road, or else in the garden of the Exhibition, close to the Cromwell-road, north side, where it would be equally conspicuous in all directions.

If placed upon a pedestal, this ought not to exceed 6 ft. in height; and if a monolith of granite could be procured, of, say, 3 ft. or 4 ft. in thickness, to cap the base, it would be more appropriate.

As an additional tribute of dignity to our unequalled National Institution, few will disagree with the allocation as recommended by

T. H. H.

VENTILATION: GOLDSMITH RESIDENCES.

Sir,—Mr. Banister Fletcher's ventilation of these buildings will most assuredly not answer, if by ventilation we are to understand the admission of fresh air without discomfort. True enough fresh air will enter the rooms as he has shown (*i.e.* through perforations in the head of the sash, and perforated zinc panels in the top architrave), but in winter, owing to its density and coldness, together with the suctional power of the flue from the fire, it will be a nuisance to the occupants of the rooms—the perforated zinc notwithstanding. Mr. F. tells us that "the problem was how to obtain ventilation day and night in such a position as to be unnoticed by the tenants; for as you are well aware, the first thing that is done by the majority of tenants of the class for which these residences are intended is to paste over or otherwise block up all ventilators." And this will be the fate of Mr. F.'s ventilators. I wonder whether Mr. F. has treated the windows of his own house in the manner he suggests, and has enjoyed the benefit of a winter's experience under them. If he has not—and I am sure he has not—I advise him to do so before he again adopts it. The thing is radically wrong, and the perforated zinc merely modifies the nuisance. Can Mr. F. tell your readers where it has been tried and approved?

Hygeia.

*** Five other correspondents object to the plan.

CUTTING OFF THE GAS TOO SOON.

BLAKE *v.* THE LONDON GAS COMPANY.

This case was heard in the Brompton County Court the other day. The plaintiff, a painter and gas-fitter, of Walton-street, Chelsea, sought to recover damages against the defendants for improperly cutting off his gas and removing the meter.

It appeared from the evidence that the plaintiff had been but a very small customer of the defendants, and on the 9th of July last, two of the defendants' servants passed the premises in Walton-street, and discovered that brokers were in possession. Fearful that the meter should be lost or damaged, they went in, and without any notice, detached it from the pipes and took it away.

On behalf of the plaintiff it was not denied that he was in a very impecunious position, but it was contended that the loss of the gas, under the circumstances, made his affairs worse; also that the Gas Company were bound, under Act of Parliament, to give twenty-four hours' notice of the removal of the meter.

The jury returned a verdict for the plaintiff for 5*l.*

OVERCROWDING IN CHELSEA.

A LESSON TO LANDLORDS.

At the Westminster Police Court, on the 5th inst., Mr. Charles Edney, the owner of the premises, 10, Symond's-street, Chelsea, was summoned to show cause why an order should not be made on him requiring him to do away with certain existing nuisances at the house in question.

Mr. Jonathan Young, the sanitary inspector of the parish of Chelsea, said the defendant had notice on the 6th of last month to abate nuisances that existed on the premises, viz., that the drains were untrapped, water of a fœtid character percolating the foundations, and other neglect of sanitary precautions. The notice had been totally disregarded, and on the 29th ult. the summons was taken out, to which the defendant did not now appear. It was a six-roomed house, occupied by no less than six families, amounting to twenty-three souls; the ground of the yard was rotten, and the soil from the neglected drains, which were opened on the 29th ult., and had not been closed, was lying about the yard, and the basement was in a filthy state, so much so that Dr. Barclay, the medical officer, was of opinion that epidemic disorders would be spread. Already the parish had taken proceedings against the owner for overcrowding the premises.

Mr. D'Eyncourt said he should make an order that the work be done in twenty-one days.

Mr. Young said the matter was a serious one. The

drains were stopped and could be unstopped in a day or two, and the whole of the work done in three or four days with due attention.

Mr. D'Eyncourt made the order for the work to be done in seven days, and the costs of the proceedings to be paid.

Miscellanea.

The Importance of Training the Senses. "The importance of training or educating the senses becomes evident when we reflect that it is from impressions received through the eye and the ear that men are enabled to bear witness to what passes in the external world; and teachers of drawing and of music only fully know what false witnesses, without any *mal prepense*, these senses are before they have been properly trained. Let it not be forgotten either that it is upon the testimony of these two senses that character and life are frequently at stake. The desire to obey the commandment, 'Thou shalt not bear false witness," may be strengthened, but evidence, nevertheless, cannot be guaranteed by a man being put upon his oath. For if a witness be an imperfect observer by eye and by ear, as he commonly is, in default of his not having received that sense-training upon which we are insisting, he may quite conscientiously swear to the absolute truth of his false impressions, of his imperfect perceptions. There is an art-teacher who frequently points this moral in his class,—'If,' he says, 'you misapprehend the truth with respect to the model immediately before you, and biding your own time to be deliberately inspected, how can you expect to accurately observe and recollect the moving scenes and occurrences of every-day life?' It is, however, not only in the witness-box that trained senses are required, but for the recognition and appreciation of beauty in nature to preside watchfully over all kinds of work, and to endow the arts and the manufactures of a nation with those excellent qualities which would ensure their appreciation throughout the civilised world. We are now, of course, referring more immediately to the sense of sight. You will find that painters and sculptors can more readily turn their hands to any kind of work than any other men,—and why? Not solely because their professions require the greatest nicety of touch, but because their sense of vision having been better trained they see more correctly. . . . . Drawing, modelling, and instrumental music contribute respectively to the perfecting of sight and of touch, and of hearing and of touch,—to the perfections of those three most important senses by which all work is compassed. They are to those senses what gymnastics are to the general physique."*

Suggested National Collection of Photographs.—"One of the Many" writes to the *Daily News* proposing that the National Gallery Authorities should "make and exhibit for public benefit a national collection of photographs that should show by means of permanent fair-sized photographs, taken from the objects themselves—as complete a collection as possible of the time-honoured treasures of painting, sculpture, and architecture—the relics of the best times of art that those who travel go abroad to see. Thus, the collection should comprehend photographs of each of the famous buildings and valued ruins; those of a kind hung together, and grouped according to their style, with photographs again of rich details enlarged. It should show the famous pictures, each artist's works being hung together, and grouped by their subjects. The antique statues and bas-reliefs; those of the same personages together and grouped by their attitudes. And Michelangelo's statuary. Lastly, the whole number of photographs should be repeated on a small scale, grouping them according to the towns to which each object belongs. Such a school as this collection would be ought to improve gradually the art of the country, when architects and those who employ them—painters and sculptors, and those who judge their work—have the power of seeing and growing familiar with the best samples of the sublime and beautiful in art that the world boasts."

Lectures on Health.—Under the auspices of the Trades Guild of Learning, a course of twelve lectures on "Life and Health" will be delivered in the Town-hall, Shoreditch, by Dr. Richardson, F.R.S., commencing on Monday evening next, to be continued on subsequent Tuesdays and Fridays.

* "Symmetrical Education." By W. Cave Thomas. Smith, Elder, & Co. 1873.

The Rivers Pollution Act, 1876.—The first public inquiry under the Rivers Pollution Act of 1876 was held at Canterbury on the 24th ult. by Mr. Robert Rawlinson, C.B., who attended to hear an application by the local sanitary authority for a certificate under the Act in question, to the effect that the means used by them for rendering harmless the sewage matter flowing or carried into the river Stour from their sewage outfall works are the best or only practicable and available means under the circumstances of the case. The application was opposed by the Commissioners of Sewers for East Kent. Evidence was called to show that since the completion of the Canterbury sewage works in 1868 the river below the outfall, for a distance of about eight miles, was constantly in an impure state, the water being discoloured, and there being a thick black sediment at the bed of the stream; also that a most offensive smell arose from the water, and that some of the men who work in a boat used by the Commissioners of Sewers had been stricken down with typhoid fever, caused presumably by the "abominable stench," as one witness termed it. The town council have adopted a crude form of filtration, which, according to the witnesses for the commissioners, is utterly incapable of purifying the sewage matter so as to render it harmless. It was shown, also, that irrigation could be conveniently carried on in connexion with the works. After hearing the evidence, the inspector said he would make a personal inspection of the works and the river, and would then report the result of his inquiry to the Local Government Board.

The Labour Question in America.—An American paper says that the A. & W. Sprague estate, New York, now employs about 10,000 hands, and Mr. Chaffee, the trustee and manager, says that, although the men are now receiving less wages than at any period since the establishment of the Sprague Works, nearly half a century since, he has never seen them so contented. He ascribes the cheerful condition of his working people under low wages and the general labour disturbances mainly to the fact that the estate furnishes each head of a family enough ground for a good-sized garden, or from a quarter to half an acre of tillable ground. The scant wages have forced them to carefully cultivate these little plots, and the people find that they can almost raise subsistence for their families. So, instead of want, they have fair support, and even many luxuries, for their families, and from the lowest wages are able to lay by. Besides, the care of cultivating these gardens, and keeping a pig or cow, or both, not only holds the men from the dissipation incident to idle hours, but furnishes healthful recreation, and inculcates a home sentiment and sense of security and proprietorship that eminently improves the *morale* of the labourer.

New Non-Pauper Hospital for Paying Patients.—Last week the memorial-stone of the first permanent hospital for the reception of poor, but non-pauper, patients, under the 37th section of the Sanitary Act, was laid. On Thursday, the members of the District Board met at the offices in High-street, Poplar, whence they were conveyed to Plaistow. Mr. E. L. Bracebridge, a member of the Board, is honorary architect of the building. The clerk of the works is Mr. C. Brown; the builder and contractor, Mr. J. W. Martin, of Stratford. The ground measures 196 ft. by 170 ft., and with the building will cost 14,000*l*. There will be two blocks or pavilions, two stories in height, each block to accommodate thirty-six patients. A third block will contain the administrative department. The cost is to be spread over twenty years, and a halfpenny rate on the present assessment will more than repay principal and interest.

New Sessions-Room at Northop, near Mold.—A picturesque gabled structure has just been erected in the village of Northop, to serve as a new sessions-room and police-station. The lower portion up to the first floor is of red brick, and the windows have mullions of brick, but above that there is black and white timber framing, with wood casement windows. The building is roofed with green slates, and has been lately erected by Mr. J. Scott Bankes, from the designs of Mr. John Douglas, architect, of Chester, at a total cost of 750*l*. It is customary in this part of the country to hold Petty Sessions in hotels and public-houses, but this, it has been thought, is hardly consistent with the dignity of the bench, and hence the erection of these new buildings.

Victorian Schools of Design.—At the sixth annual distribution of prizes to the pupils of Schools of Design associated with the Technological Commission, Judge Bindon, who presided, congratulated the pupils, teachers, and committees of the Schools of Design on the progress that it was evident had been made. It was a general opinion that the exhibition this year was the best that had yet been held. The committee had feared that in design and ornamental and mechanical drawing there might be failure, but in those subjects the pupils had been better than in others. The President concluded by remarking that there was an examination of competitors for prizes at every exhibition, and it was most thorough. This year 206 submitted themselves. There were now twenty-two schools, and 1,458 scholars attending them. Professor M'Coy also addressed the assemblage shortly. The distribution of prizes then took place. The successful competitors were from many schools, the teachers whose scholars succeeded best being Messrs. Brunn (Ballarat), Sasse and Pye (Geelong), Oldham (Ballarat West), Roberts (Trades' Hall), Carter, &c.

House Ventilation.—At the invitation of Mr. John Westmorland, a large party attended at the residence of Mr. Emil Quack, Greenbank House, Mossley-hill, Liverpool, to inspect a new method of house ventilation patented by him. The ventilator is constructed of an iron frame, which fulfils a double purpose. The object obtained is the rapid abstraction of air from its position in the ceiling of a room. In the presence of the company experiments were made, and, with the windows and doors closed, by the application of an anemometer to the extraction flue, it was shown that it registered 560 cubic feet of air per minute, which is equivalent to changing the entire atmosphere of the room every six minutes. With the door open, allowing greater inlet, the anemometer registered 1,440 ft. per minute, equivalent to changing the entire air of the room in three minutes. In this room a brisk fire was burning at the time. There were other experiments made in the library, without a fire, when the anemometer registered 320 cubic feet per minute, being equivalent to changing the air of the room every five minutes.

Intimidation by a Joiner.—Before the Oldham magistrates, the other day, Joseph Wharmby was charged with intimidation. The evidence went to show that the defendant and a number of other joiners out on strike formed a picket and went to the works of Mr. E. Whittaker, joiner and builder, to catch the workmen as they were leaving for their homes. Defendant threatened one of the workmen, and afterwards went into the yard of the works, and was ordered out by Mr. Nathan Rucroft, the manager, whom he said he would "remember," and he afterwards threatened to stick a knife into him. William Clegg, a workman in the employ of Mr. Whittaker, further stated that he was going home on the night in question, and was met by the defendant, who asked him if he was "knobsticking." Witness replied that he was not, but merely looking after his own interests. Defendant thereupon challenged him to fight, and said he would "do for him." Defendant was committed to prison for one month.

Dispute regarding Plans.—At the Sheriff Small Debt Court, Wick, on the 2nd inst., an action was raised before Sheriff Russel, by Mr. Alexander M'Tavish, architect, Inverness, against the managers of the United Presbyterian Church, Pulteneytown, for payment (5*l*. 5s.) of designs submitted in competition for the new United Presbyterian Church, now in course of erection. The question was whether the pursuer was entitled to payment on the plans being opened and exhibited; or whether they were to be exhibited in competition with others, and, if approved of, retained. The Sheriff having heard parties, found that the managers of the church had dealt in good faith with the pursuer, and that the plans could never come into competition without being opened, and therefore assoilzied the defenders from the conclusions of the action.

Suicide of Mr. Raphael Brandon.—We regret to announce that Mr. Raphael Brandon architect, committed suicide on Monday afternoon at his chambers, Clement's-inn, by shooting himself in the temple with a pistol. The deceased gentleman's manner of late is said to have been sufficiently strange to cause some anxiety to his friends. Mr. Brandon leaves behind him a widow and one child.

The Pneumatic Clocks of Vienna.—Mr. John Fattorini, of Bradford, a practical clock and watch maker, states that on a recent visit to Vienna he had the opportunity of thoroughly inspecting the system adopted by an Austrian engineer, Herr C. A. Mayrhofer, who has hit upon the expedient of pneumatic tubes as a means of securing uniformity in the time of clocks in any part of the city. Tubes are laid in the streets from the central station in which is the "master clock," or rather two clocks working together, and should one get wrong the other keeps in motion, and an alarm-bell is rung to indicate to the attendant that something is wrong, and he at once rectifies it. The air is pumped from the station; and just as gas or water can be taken into houses by means of pipes, so can the pneumatic tubes be laid, and people can receive their time just as they get their water and gas, the tubes being always kept fully charged with air. Branches can be taken in any direction. Housekeepers and others can be relieved of the trouble of winding up their clocks, as nothing of the kind is required in the pneumatic system. A small yearly charge is made for the clocks, and there is no further expense or trouble.

Sewer Ventilation in Gloucester.—Mr. Mansergh, the borough engineer of Gloucester, has issued a report on the ventilation of the city sewers. He defends the system he has carried out in the added parts of the city of ventilating the sewers as the most effective method of preventing the accumulation of injurious gases. He recommends that the ventilators be increased in number, and that house-drain branches should be ventilated by having soil-pipes carried up above the roofs in suitable places. He says the greater the number of ventilators the better, and he advises that all the old sewers be kept clean and free from deposit, the renewal of old sewers through which the sewage penetrates, and to carry out through the sewers in the old city a system of ventilation similar in principle and extent to that in operation in the added districts. Ventilators, he says, ought to be applied to the seventy existing manholes, and 300 ought to be added.

Excavations at Trier.—At Trier fresh excavations have been made near the so-called Roman Emperor's palace. A great number of marble slabs turned up, as well as a marble torso which once belonged to a life-size draped figure. Near by, one half of a sculptured female head, and a fragment of drapery which may have belonged to the figure, were dug up. Fragments of a wall covered with fresco paintings were also laid bare. Excavations made by way of trial near the city wall produced surprisingly rich results, such as the sculptured head of a satyr; a very expressive head of a winged Morpheus, with closed eyes; the head of a woman and one of a youth; a great many fragments of arms, various torsos, and pieces of drapery. Other antiquities are expected to come up.

Fire.—We are asked to say that the damage done by the fire which occurred last Sunday morning, on the premises of the Patent Concrete Building Apparatus Company, in the Blackfriars-road, will in no way interfere with the works, and that business will be carried on as usual.

TENDERS.

For the erection of the Victoria Ironworks and Implement Warehouse, Bristol, for Mr. W. Baker, Temple-street, Bristol. Mr. W. Clontman, architect:—

Walters	£960	0	0
Thompson	954	0	0
Crick	870	0	0
Church	869	0	0
Munro	860	0	0
Kidner	845	0	0
Veals	840	0	0
Eastabrooke & Sons	830	0	0
Hatherley	818	0	0
Humphreys	812	0	0
Bateman	781	0	0
Banner	780	0	0
Lewis & Edbrooke	778	0	0
Philips & Jefferies	766	0	0
Stevens & Bastow	750	0	0
Davis	755	0	0
Cowlin	742	0	0
Hill (accepted)	737	0	0
Stephens & Gardiner	669	0	0

For a residence at Enfield for Mr. M. Latham, Clay Hill. Mr. T. J. Hill, architect. Quantities by Messrs. Osborne & Russell:—

Downs & Co.	£8,602	0	0
Moreland & Nixon	8,570	0	0
Browne & Robinson	8,490	0	0
Sabey & Son	8,150	0	0
Bayes, Brothers, & Allen	7,758	0	0
Sewell & Son	7,573	0	0
Linzell & Son	7,500	0	0
Patman	7,466	0	0

For painting and decorative works at 54, Cleveland-square, for the Union Fire Office. Mr. J. Tavenor Perry, architect:—

Pitman & Cuthbertson	£580	0	0
Clements	487	0	0
Clark & Bracey (accepted)	417	0	0

For building a house and shop at No. 64, Chalk Farm-road, for Mr. O. Bacon. Mr. J. R. Furniss, architect:—

King	£1,139	0	0
Sommerville & Smith	998	0	0
Drew	930	0	0
Chessum	911	0	0
Harris & Wardrop	897	0	0
Manley & Rogers	888	0	0
Wall Brothers (accepted)	847	0	0

For the erection of a coachman's residence, stables, and coach-houses at The Cedars, Harrow Weald, Middlesex, for Mr. T. F. Blackwell. The late Mr. R. L. Roumieu & Messrs. Roumieu & Kesteven Hill, architects:—

Lawford (accepted)	£2,341	10	0

For the erection of a gardener's shed at the French Protestant Hospital, Victoria Park, for the governor and directors. Mr. Reginald St. A. Roumieu, honorary architect. No quantities supplied:—

Bartholomew	£395	0	0
Longmire & Burge	339	0	0
Macey & Son (accepted)	310	0	0

For new barracks, Shorncliffe.
Clemmans (accepted).

For retaining walls and forming and making Albany-street, Ashley Hill, Bristol. Mr. Herbert J. Jones, surveyor:—

Ford	£408	11	0
Merewether	377	5	0
Yalland & Son	310	0	0
Humphreys (accepted)	295	0	0

For rebuilding houses in Lincoln's-inn-fields. Mr. W. Beeston, architect:—

Moyle & Son	£3,627	0	0
Kinsimont	2,808	0	0
Green	2,789	0	0
Benstead & Son	2,750	0	0
Downs & Co.	2,710	0	0
Staines & Son	2,686	0	0

For houses at Acton for Mr. W. M. Read:—

Wild	£3,375	0	0
Macfarlane & Co.	3,034	0	0
Lawrence	3,026	0	0
Pickeragill	2,885	0	0
Kellaway	2,254	0	0
Robinson	2,242	0	0

For road-making and sewers for the British Land Company, Limited, on their estate at Stratford:—

Kilingback	£2,900	0	0
Pearson	2,627	0	0
Crockett	2,107	0	0
Jackson	1,909	0	0
Pizzey	1,865	0	0
Richardson (accepted)	1,850	0	0

For erection of parish room for St. Mary's Church, Newington. Mr. J. E. K. Cutts, architect. Quantities by Mr. F. W. Hunt:—

Riley	£1,390	0	0
Marsland	1,248	0	0
Tyerman	1,230	0	0
Downs & Co.	1,190	0	0

For the construction of adits and shafts for the Droitwich water supply. Mr. E. Pritchard, engineer. Quantities by Mr. C. J. Parnell:—
Contract No. 1.

Lovatt	£2,102	5	6
Bourne	1,903	0	0
Wood	1,665	0	0
Brazier & Weaver	1,093	0	0
Robinson	1,090	0	0
Dixon	962	18	0
Hilton & Co.	873	0	0
Everest	850	0	0
Law (accepted)	734	0	0

For works required in the extension of the Royal Masonic Institution for boys, Wood-green. Mr. S. B. Wilson, architect:—

Brooks	£3,768	0	0
Pritchard	3,548	0	0
Fish	3,526	0	0
Morter	3,230	0	0
Patrick & Son	3,245	0	0
Killby	3,172	0	0
Waldram & Co.	3,075	0	0
Higgs & Hill	3,040	0	0
Brass	2,917	0	0
Larter & Son	2,885	0	0
Wagner	2,749	0	0
Mattock Brothers	2,671	0	0
Prout	2,497	0	0

For new schools, Shepperton-road, Islington, for the London School Board. Mr. R. R. Robson, architect. Mr. T. Thornton Green, surveyor:—

Higgs & Hill	£8,511	0	0
Boyce	8,333	0	0
Sheffield	8,129	0	0
Tongue	8,023	0	0
Thompson	7,962	0	0
Downs	7,915	0	0
Pritchard	7,842	0	0
Nightingale	7,816	0	0
Tyerman	7,687	0	0
Grover	7,627	0	0
Kirk & Randall	7,296	0	0

For part building and completing of six houses in Castle-lane, Battersea, for Mr. J. Trott. Mr. Henry J. Hansom, architect:—

Picking	£990	0	0
Isaacs (accepted)	950	0	0

For stable, hay and corn store, in rear of 71, Bridge-road, Battersea, for Mr. Birchall. Mr. Henry J. Hansom, architect:—

Turtle & Appleton	£155	0	0
Baker (accepted)	125	0	0

For warehouse and offices, Church-road, Battersea, for Messrs. May & Baker. Mr. Henry J. Hansom, architect. Quantities supplied:—

Moxey	£1,553	0	0
Gregory	1,523	0	0
Lathey Brothers	1,510	0	0
Macey & Sons	1,526	0	0
Baker	1,490	0	0
Hammond	1,410	0	0
Hobson	1,390	0	0
Turtle & Appleton (accepted)	1,275	0	0

For new schools, Tooley-street, for the Rev. Canon Bamber. Mr. Henry J. Hansom, architect. Quantities by Mr. H. Smith:—

Smith	£1,895	0	0
Lathey Brothers	1,834	0	0
Gregory	1,817	0	0
Stimpson & Co.	1,782	0	0
Turtle & Appleton	1,765	0	0

For laundry in rear of 77 and 79, Bridge-road West, Battersea, for Mr. Francis. Mr. Henry J. Hansom, architect:—

Appleton & Turtle	£365	0	0
Stimpson & Co.	348	0	0
Baker	311	0	0
Hammond (accepted)	310	0	0

TO CORRESPONDENTS.

A. S. R. (must decide on the published testimonials. We cannot find space for what would be merely an advertising correspondence. Our opinion would be in favour of the dug well).—H. S.—P.—S. G.—T.—J. J.—H. G.—S. D.—R. E. R.—W. W. L.—J. M.—Mrs. L.—T. L.—H. U. McK.—T. L.—E. J. H.—T. T.—J. A. H.—J. B.—F. E. (No)—G. W. U. (next week).

We are compelled to decline pointing out books and giving addresses.

All statements of facts, lists of tenders, &c. must be accompanied by the name and address of the sender, not necessarily for publication.

Note.—The responsibility of signed articles, and papers read at public meetings, rests, of course, with the authors.

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